TWO-PART INTERSOMATIC IMPLANT

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Abstract of **WO 9848738 (A1)**

The invention concerns an implant for backbone surgery essentially comprising a hollow body (10) to be inserted in an intervertrebral space, said body having a pair of lateral walls (102, 103) enclosing an internal space exposed to the superjacent and subjacent vertebrae defining said intervertebral space. The implant further comprises an anchoring reinforcement member (20) having on its outer surface bone anchoring projections (22) inscr bed in a diameter greater than the body overall height, said member being driven in rotation in the inner space of the body. The invention concerns various improvements to such a two-part implant.

Result Page

IMPLANTS INTERSOMATIQUES IN TWO PARTS

The present invention generally has stroke with the usable implants intersomatic in the surgical treatment of the rachis.

One knows already very numerous implants intersomatic.

One knows in particular implants of more or less complex structure, carried out in several parts particularly to confer certain characteristics of deformability to them. These known implants are désavantageux in what they are more expensive and difficult to manufacture, and which poses to them proves more delicate. They can suffer also from a problem of reliability in the long term.

One also knows implants which, so particularly mitigating whole or part of the disadvantages cidessus, presenting the shape of hollow body integral, or cages, provided with asperities on their faces upper and posterior to ensure a good initial locking compared to the vertebral trays overlying and underlying, their hollow character allowing an osseous growth through them and, in the long term, their definitive locking.

Learnedly the FR-A-2 703.580 described an example of such an implant.

These known implants integral, in spite of the presence of asperities which come to be anchored in the vertebral trays when the intervertebral distraction required with their placement is removed, can have in certain cases an insufficient stability, the quality of the anchoring, which is carried out by a single translational motion, being tributary particularly of the hardness of the bones.

One also knows by document DE-U- an implant which comprises an outer body in which can be engaged by screwing an inner member of reinforcing of anchoring, whose nets overflow audessus and below the faces upper and low this outer body.

The present invention aims at improving this type of known implant.

SUMMARY OF THE INVENTION

An implant for the surgery of the rachis includes/understands a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space. The implant includes/understands moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body.

To be opposed to the inverse movement of the aforesaid body out of the aforesaid intervertebral space, and thus to still improve the maintenance of the implant in position, the aforementioned hollow body has provided surfaces upper and low teeth with sharp edges adapted to be anchored in the aforementioned vertebrae.

Preferably, the aforementioned teeth present a triangular cross-section.

According to another aspect, to improve the compactness of the implant and to facilitate its placement, the aforementioned lateral walls of the hollow body are partially cylindrical and coaxial with an axis of the aforesaid reinforcing member of anchoring.

According to another aspect still, to support the osseous growth outside the implant, in particular laterally, the aforementioned lateral walls have through openings authorizing an osseous growth through them.

Advantageously, these openings include/understand elongated slits extending substantially parallel to the direction from insertion of the aforesaid body in the aforementioned hollow body.

To give to the body a larger width, one can use for the lateral walls of the body of the thick walls in which second through openings are formed extending between the faces upper and low body. An osseous growth can also be caused between the two vertebral trays through these second through openings.

Preferentially, the aforementioned crossing first apertures put in communication the aforementioned inner space with the aforementioned second through openings.

One can envisage moreover through openings putting in communication the aforementioned second through openings with the outer sides of the body.

According to another aspect of the invention, the hollow body has a wall of distal end connecting the aforementioned lateral walls, and this wall of distal end is round to facilitate insertion of the aforesaid body hollow in the aforementioned intervertebral space.

L invention also proposes an implant such as defined higher, in which the hollow body has a wall of distal end connecting the aforementioned lateral walls, and this wall of distal end has a tapped hole for temporary fixing of the aforesaid hollow body with an instrument of insertion of the body, for thus facilitating its placement by the surgeon.

▲ top

According to another aspect, the aforementioned projections of osseous anchoring include/understand a threading of screw autotaraudor.

This threading can present a generally quadrangular radial section.

Preferentially, this threading of present screw a radial section which pass progressively of a substantially triangular radial section with the aforementioned generally quadrangular radial section starting from the distal end of the aforesaid threading, while the diameter of the threading of screw increases progressively starting from its distal end until a diameter portion substantially constant.

One also in accordance with the invention proposes an implant in which the aforementioned projections of osseous anchoring include/understand a threading of screw in the shape of a helical strip encircling an inner space of the aforesaid reinforcing member of anchoring.

This helical strip is advantageously connected to a fork extending inside oe the aforementioned strip in an axial direction of the aforesaid body, and this fork includes/understands two legs preferably extending starting from a wall from proximate end of the aforesaid reinforcing member from anchoring.

The fork can include/understand legs also presenting an outer surface in the form of part of truncated cone whose diameter decreases by the proximate end towards the distal end of the body. This makes it possible to compress a substance promoter of osseous growth préalalement placed in the reinforcing member of anchoring, at the time of the screwing of this last.

In variant, the fork includes/understands at least two legs possessing each one an edge cutting edge of driver of the bone for thus accumulating chips of bone inside body 20 and facilitating osseous fusion.

I1 is preferable that the helical fork and strip are carried out of only one taking.

The invention also proposes an implant in which the projections of osseous anchoring include/understand a threading of screw, and in which the aforementioned body has locking means of this one against a reverse rotation. Preferentially, these locking means include/understand a deformed portion of the aforesaid threading in the region of its proximate end. One thus improves the behaviour of the implant jusqu has what fusion is carried out.

According to another aspect, the projections of osseous anchoring include/understand a possessing threading of screw an outer diameter which decreases in its distal region towards its distal end, to facilitate the penetration of this threading in the vertebral trays.

In addition it is proposed that the aforementioned reinforcing member of anchoring has a wall of proximate end adapted with substantially closing a front opening of the aforesaid body hollow, so that a substance promoter of osseous growth placed inside the said body is compressed pendent insertion of the aforesaid body in the aforementioned hollow body.

In this case, the reinforcing member of anchoring has at least a part of which the outer surface belongs to a truncated cone. In variant, the reinforcing member of anchoring is substantially more short than the body and has a generally conical tip directed towards the aforementioned wall of distal end of the body:
I1 is beneficial in this case that the wall of proximate end of the body has an opening tapped for temporary fixing of the aforesaid body with an instrument of insertion of the body.

According to another aspect still, the invention proposes an implant such as defined higher, in which the reinforcing member of anchoring has indexing means to fix the aforementioned body at an instrument of insertion of the body in a given angular relationship.

According to another characteristic, the reinforcing member of anchoring has at its proximate end a brought back plug, which can for example be screwed in a tapped front opening of the reinforcing member of anchoring, or engaged by resilient click-and-ratchet work in a front opening of the reinforcing member of anchoring.

I1 is beneficial that this plug has an installation adapted to cooperate with an instrument making it possible to involve the body in rotation, and/or of the adjustments of angular indexing of the reinforcing member of anchoring with an instrument of installation of the aforesaid body.

It is proposed also in accordance with the invention that the projections of osseous anchoring include/understand a threading of screw, and that at least one of the side branches of the body has a reentrant part forming net adapted to cooperate with the aforementioned threading.

This reentrant part can be envisaged only on one of the legs and to then constitute the single body part cooperating by screwing with threading of screw.

Moreover, this reentrant part can present a substantially straight free end edge.

According to another aspect, the invention proposes an implant in which the aforementioned body is directed into oblique, for example to approximately 450, compared to a plane of the corresponding body to the sagittal plane.

According to another aspect, it is proposed that through openings are envisaged in the aforementioned body between the inner one and the outer one of this one, the aforementioned openings being elongated in a substantially circumferential direction of the body.

According to a still different aspect, the body has a wall of distal end, and the reinforcing member of anchoring has a distal end portion adapted to be screwed in an opening of the aforesaid the wall of distal end.

The body can also have in this case a wall of proximate end including an opening wider than outer dimension of the aforesaid reinforcing member of anchoring and in which the aforementioned body can be freely committed.

The invention in addition proposes an implant in which the body present a proximate wall, a distal wall and two lateral walls, the aforementioned walls defining between them an inner space larger than the aforementioned reinforcing member of anchoring. One thus increases assigned space with the osseous growth between the known and underlying vertebral trays.

In this case, the reinforcing member of anchoring can have a threaded portion for its screwing in the proximate wall of the body, or the aforementioned reinforcing member of anchoring and the distal wall of the body can mutually have means threaded cooperating for fixing of

the aforesaid body with the body.

In such a configuration, the projections of osseous anchoring can include/understand a threading of screw having the same step as the aforementioned threaded portion or the threaded means of fixing to the body.

The shape of the body, in this case, is preferably such as the lateral walls and the proximate wall of the body extend substantially on a same circular arc, and that the aforementioned distal wall is substantially straight.

I1 is also beneficial that the faces upper and low of the body have projections of osseous anchoring extending along its walls.

I1 is also envisaged in accordance with the invention a provided implant of means for the rotating mounting of the reinforcing member of anchoring in the inner space of the body while preventing a translational motion relative between those.

These mounting means advantageously include/understand a formed cylindrical aperture in a wall of distal end of the aforesaid body and a shaft envisaged on the aforementioned body and adapted to be engaged by resilient deformation in the aforementioned opening.

In this particular case, the aforementioned reinforcing member of anchoring present preferentially the shape of a screw possessing two flat diametrically opposite, the aforementioned projections of osseous anchoring being defined between the aforementioned flat and of the edges cutting edges being envisaged with the transitions between the threading of the screw and the flat ones for thus supporting osseous fusion after installation of the implant.

To facilitate the insertion of the implant, the distance between the flat opposite ones is not upper at the distance between the faces upper and low of the aforesaid body.

According to another aspect of the invention, one proposes an implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a whole of generally parallel walls defining at least two inner spaces located side-by-side and exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover at least two reinforcing members of possessing anchoring about their outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned bodies being adapted to be involved in rotation in respective inner spaces of the aforesaid body.

Advantageously, the aforementioned bodies are identical.

The invention provides in addition that the hollow body can have different geometries, and in particular
- surfaces upper and low which are inclined one compared to the other, with a distance between them which decreases by the proximate end towards the distal end of the body; and/or
- surfaces upper and low which are inclined one compared to the other, with a distance between them which decreases by a lateral first side of the body towards the opposite lateral side.

The invention in addition proposes a set of implants to form a rachidian implant intended to be inserted in an intervertebral space of the human spine while being adapt with the geometry of the aforesaid intervertebral space. This set of implants includes/understands
a plurality of hollow body possessing each one a pair of walls lateral delimiting an inner space and adapted each one to be inserted in an intervertebral space in such a way that the aforementioned inner space is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, each one of the aforesaid body having a specific size and a form,
at least a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the bodies, the aforementioned body being adapted to be involved in rotation in the inner space of any of the aforesaid body,
so that a specific hollow body suitable with the particular configuration of a given intervertebral space can be selected among the aforementioned plurality of hollow body.

The sizes and the specific shapes of the bodies can result in particular
- different angles of inclination between their upper and low surfaces.

- different widths; in this case, the hollow bodies widest advantageously present lateral walls in which through openings are formed extending between the upper and low faces of the aforesaid body
- different heights.

- different lengths.

Preferentially, a determined group of hollow body of the aforesaid plurality is adapted to receive a same type of reinforcing member of anchoring.

The invention proposes finally a method to position in an intervertebral space of an human spine a comprising implant a possessing substantially hollow body a pair of lateral walls surrounding an inner space and a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body and adapted to be involved in rotation in the inner space of the body, the aforementioned comprising method the following steps
to select starting from a set of possessing hollow body different forms and dimensions an hollow body adapt with the configuration of the aforesaid intervertebral space
to fill the aforementioned hollow body selected with a substance promoter of osseous growth
to push the aforementioned hollow body in the aforementioned intervertebral space in such a way that the inner space of this one is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space; and
to insert the aforementioned reinforcing member of anchoring in the aforementioned hollow body in such a way that the aforementioned projections of osseous anchoring are anchored in the aforementioned vertebrae suset underlying.

If one wishes to position an implant which the body present of the provided lateral walls of through openings extending between the faces upper and low of the aforesaid body, the method can include/understand moreover, before the step of push of the aforesaid hollow body in the aforementioned spaced intervertebral, a filling step of the aforesaid through openings with a substance promoter of osseous growth.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects, purposes and benefits of the present invention will appear better with the reading of the detailed description following of prefered forms of performing of this one, given as example and made in reference with the annexed drawings, on which
figure 1 is a perspective view of an implant according to a first shape of performing of the invention,
figure 2 is a view of profile of the implant of figure 1 placed between two vertebral trays,
figure 3 is a view of face of the implant of figure 1,
figure 4 is a view of top of the implant of figures 1 and 3,
figure 5 has is a side view of a member of the implant of figure 1,
figure 6 is a view boils about it according to the arrow VI of figure 5,
figure 7 is a view boils about it according to arrow VII of figure 5,
figure 8 is a perspective view of the member of figures 5 to 7,
figure 9 is a perspective view of an implant according to one second form of performing of the invention,
figure 10 is a view of face of the implant of figure 9,
figure 11 is a view of top of the implant of figures 9 and 10,
figure 12 is a view of top of a first member of the implant of figures 9 to 11,
figure 13 is a side view of a second element of the implant of figures 9 to 11,
figure 14 is a view boils about it according to the arrow XIV of figure 13,
figure 15 is a view boils about it according to the arrow XV of figure 13,
figure 16 is a perspective view burst of an implant according to a third form of performing of the invention,
figure 17 is a side view of the implant of figure 16, assembled,
figure 18 is a view according to arrow XIIX of figure 17,
figure 19 is a view according to the arrow XIX of figure 17,
figure 20 is a perspective view burst of an implant according to a fourth form of performing of the invention,
figure 21 is a side view of the implant of figure 20, assembled,
figure 22 is a view according to arrow XXII of figure 21,
figure 23 is a view according to the arrow XI IT of figure 21,
figure 24 is a perspective view burst of an implant according to a fifth form of performing of the invention,
figure 25 is a side view of the implant of figure 24, assembled,
figure 26 is a view according to arrow XXVI of figure 25,
figure 27 is a view according to arrow XXVI I of figure 25,
figure 28 is a perspective view burst of an implant according to a variant of the third form of performing of the invention,
figure 29 is a perspective view of the implant of figure 28 with the assembled condition,
figure 30 is a view of rear of the implant of figure 29,
figure 31 is a side view of the implant of figure 29,
figure 32 is a view of top of the implant of figure 29,
figure 33 is a perspective view, before assembly, of a variant of execution of the third form of performing of the invention,
figures 34 to 36 are three perspective views of the body of this variant of execution,
figure 37 is a view in end, distal side, of this same body,
figure 38 is a perspective view of the reinforcing member of anchoring of this variant of execution,
figure 39 is a view in elevation on side of this same reinforcing member of anchoring,
figures 40 and 41 are two perspective views of the implant according to this same variant, with the assembled condition,
figure 42 is a view of top of this same assembled implant,
figure 43 is a view in elevation on side of this same assembled implant, and
figure 44 is a view in end, proximate side, of this same assembled implant.

DETAILED DESCRIPTION FORMED REALIZATION
It will be noted preliminarily that, from one figure to another, similar members or identical parts or are indicated as far as possible by the same signs of reference.

It will be noted also that the terms proximate and distal used throughout present description correspond respectively at the end of the implant on the side nearest of the surgeon during operations of installation, and at the end of the implant furthest away from the surgeon.

In reference first of all on figures 1 to 8, one represented an implant of type intersomatic cage which consists of two parts, namely a body 10 and one reinforcing member of anchoring 20.

Body 10 present the general shape of a ring, with an upper face 11, a low face 12, an inner face 13 and one outer face 14.

The contour of bodies 10 present a circular form truncated by a straight outline portion, its width being for example equal in approximately four thirds of his depth.

Along the straight outline portion, on the faces upper and low 11 and 12, asperities are spared to ensure a locking of the implant compared to the vertebral trays overlying V1 and underlying V2 (see figure 2) when the implant is compressed between those.

These asperities present in the species the form of three upper ribs lîb and three low ribs 12b, triangular section and concentric circular trajectories following the circular outline portion of the body.

Contrary to the straight outline portion, the body there has a thicker wall, materialized by ranges upper and low (not referred).

In this wall portion is spared a crossing orifice tapped 18 from which the axis extends into oblique, and preferably to approximately 45, compared to the perpendicular vertical plane with the plane distal wall of the implant, vertical plane which corresponds to the sagittal plane.

Moreover, the axis of this orifice 18, which extends substantially horizontally, pass substantially by the center of the circular outline portion, while moving towards the opposite region located at the transition between the circular outline portion and the straight outline portion.

The implant in accordance with the invention includes/understands moreover a body 20 intended to consolidate the anchoring carried out with the level of the vertebral trays.

This body present in this example the form of an hollow cylindrical core 21 with the outer surface whose an helical net 22 is spared which is

complementary formed tapping with the level of orifice 18.

Between the adjacent sections of net are spared a plurality of oblong openings 23 in the direction of the propeller of the net, with the fine ones explained further.

At its distal end, body 20 is closed by a full wall 25. With the vicinity of its opposite face defining its proximate end, it comprises a solid portion 24 in which a print in hollow 24a is formed, for example of hexagonal section, for the introduction of a screwing tool (not represented).

I1 is substantial to note, like the watch in particular figure 3, that the overall diameter D in which S inscribed the net 22 of body 20 is slightly upper with the overall height H in which S inscribed body 10, this with the fine ones explained further.

It will be observed here that the length of body 20 is such as it can be screwed in orifice 18 of body 10 until what the outer face of its proximate solid portion 24 comes substantially in the extension from the outer face 14 from bodies 10 neighbouring the aforementioned orifice.

One now will explain the use of an implant as described above. It will be observed that the same type of procedure, with the adaptations required, will be practised for the other forms of performing, further described, of the implants in accordance with the invention.

A distraction being previously operated between two vertebrae to treat, by average the quite known ones in themselves, the intervertebral disc is removed at least partially and body 10 of the implant, deprived of its body 20, is put in place, by anterior or posterior path. Advantageously, the inner space of the body is previously filled of osseous grafts, in order to in the long term ensure an intervertebral fusion by osteogenesis.

It will be observed here that the contour of body 10, with the cut side partly proximate, is such as it inscribed good in the surface of a vertebral tray. If required, one can propose to the surgeon different sizes of body 10, to choose according to the rachidian morphology of the patient, as one will further see it in detail.

The two vertebrae are then released, and a first locking of the body between the vertebral trays V1 and V2 is ensured using the ribs IIb, 12b.

Body 20 is then screwed using a tool in orifice 18. During this movement, the summit part of the net 22, which overflows slightly upwards and to the bottom compared to the summit parts of the ribs IIb, 12b, notch the faces in with respect to the vertebral trays overlying and underlying with the manner of a self-tapping screw, and thus carries out an additional anchoring which firmly comes to block the implant compared to these trays.

Moreover, the rotation of body 20 as it penetrates in the inner space, filled of osseous grafts, body 10, makes that part of these grafts will migrate through the openings 23 until in the inner space of hollow organ 20. The osseous growth thus also will occur through body 20, which advantageously will block body 20 with respect to any particularly inverse rotation being likely to affect the behaviour of the implant in the long term. In variant, one can provide also that body 20 is previously filled with osseous grafts.

Figures 9 to 15 illustrate one second form of performing of the present invention.

On these figures, similar members or identical parts or with those of figures 1 to 8 are indicated by the same signs of reference, and one will describe only the differences in this second form of performing compared to the first.

It will be noted first of all that the body 10, which present same contour as in the case of figures 1 to 8, present here a wall of substantially constant thickness on all its periphery.

This body comprises, instead of the orifice tapped 18 of the first shape of performing, smooth orifice crossing 19.

In addition a provided cylindrical ranging 16 of a threading 16a extends in the axis from orifice 19 starting from the region opposite from body 10, located substantially at the transition between its outline portions circular and of right contour.

Moreover, the body 20, which present substantially same outer contour as in the case of the first shape of performing, full, is put at hand a central bore 28 emerging with the level of its posterior face and in which is formed a complementary tapping 28a formed threading 16a on the protruding stem 16 of the body.

It will be observed here that the lead of the net 16a and associated tapping 28a is selected substantially or exactly equal with the lead of the net 22, which present remainder with the outer surface of body 20.

Around the outlet of bore 28 is envisaged a frustoconical part 27.

It will be observed finally that body 20 has on its anterior face an adjustment of screwing which is in this case consisted a protruding head 26 of hexagonal section for example.

The implant according to this second form of performing is used substantially same manner that that previously explained.

The essential difference resides in what body 20 is screwed on stem 16 with the manner of a nut, size of orifice 19 being selected so as not to make obstacle with this screwing. I1 is enough in this respect choosing a diameter of slightly upper orifice 19 with the overall diameter of the net 22. It will be noted that frustoconical part 27 of body 20 makes it possible to previously facilitate the introduction of the posterior end of the aforesaid body into orifice 19 the screwing.

The step of the net 16a being the same one as that of the net 22, the progression of body 20 in body 10 as the body is involved in rotation is such as the net 22 comes here still to bite in the vertebral trays with the manner of a self-tapping screw.

In particular, one can provide that the annular faces upper and low 11 and 12 of body 10 extend in planes having a slight skew one compared to the other, so as to adapt to the form of intervertebral space concerned. Thus one can propose to the surgeon, as one will further see it, of body 10 presenting of the different skews to adapt to the morphology of the vertebrae to treat.

In this case, the form of performing of figures 9 to 15 is beneficial in what one can give to the outer contour of body 20 a slightly

frustoconical form, so that the degree of overflow of the net 22 compared to the apexes of the ribs îîa and llb substantially constant remainder of before worms the back of the implant and that, the faces concerned of the substantially parallel vertebrae being to the faces upper and low of body 10, the anchoring by the net is substantially of the same importance of the proximate end until the distal end.

In reference now on figures 16 to 19, one represented an implant according to a third form of performing of the invention, which includes/understands a body 10 presenting in horizontal section the general form of one U, with a bottom 101 or distal wall and two walls or side branches substantially parallel 102, 103. This body comprises faces upper and low in form of U, respectively 104, 104 ', on which teeth of osseous anchoring are spared, respectively 105, 105 ', in the species of the teeth with sharp edges of triangular profile, which fill a like role with that of the ribs lîb of the previous forms of performing. One observes in particular on figure 17 that the faces upper and low 104, 104 ' are slightly approaching one the other in direction of the basic region 101.

In the distal wall 101 a threaded bore 1010 allowing is formed the temporary fixing of an instrument, not represented and conventional in oneself, for the installation of the body in intervertebral space.

Legs 102, 103 define a generally cylindrical inner space, with the fine ones explained further.

Two side branches 102, 103 of the body comprise each one a crossing longitudinal slit, respectively 106, 107, these slits being intended to authorize an osseous growth laterally.

At the open end of body 10, contrary to its bottom 101, is formed a generally circular opening delimited by a reentrant net 108 envisaged at the proximate free ends of two legs 102, 103.

The implant comprises a reinforcing member of provided anchoring 20 of an hollow heart of which the outer surface is slightly frustoconical, while narrowing of its proximate end towards its distal end. With the outer surface of heart 21 a continuous threading 22 is formed.

This threading 22, in the shape of helical formed flat strip, is adapted to cooperate with the reentrant net 108 of body 10 to allow the screwing of body 20 inside the said body.

As one observes it in particular on figure 16, heart 21 is consisted three angularly shifted longitudinal legs, separated by empty spaces longitudinal 23.

Each one of these legs comprises a leading edge (i.e. the front edge in the direction of the screwing of body 20) which is cutting edge in 21a, so as to constitute a body of scraping of the osseous of the vertebrae known and underlying material. Way, the screwing of body 20 will make it possible to fill inner space of the implant with osseous chips, which will support the taken one of Clerc's Office and finally the weld by osseous growth between the two vertebrae.

One will observe here that the outer diameter of threading 22 is preferably very adjacent inner diameter of body 10, so as to ensure, at the time of the screwing of body 20, his guidance inside the body.

Finally body 20 comprises, in its proximate portion 24 formant a casing, an opening delimited by a plurality of bosses 24b separated by zones in hollow 24c. The bosses 24b, which constitute the leader of legs 21 of the heart, carry to their inner surface a tapping.

The implant comprises finally a generally cylindrical plug 30 possessing with its outer surface a threading 31 adapted to cooperate with defined tapping by the bosses 24b. The posterior face 32 of this plug is provided with a print in hollow 32a for a screwing tool.

The implant as described above is used like in the following way
- body 10, deprived of body 20, is put in place between the vertebrae to treat;
- body 20, deprived of its plug 30, is filled with osseous grafts by its posterior opening, then the plug is put in place in this opening to prevent that the grafts do not escape;
- body 20 provided with its plug is then screwed in body 10 already in place, using a screwing tool engaged in the print 32a; during this operation, threading 22 of body 20 comes to be anchored in the surfaces in with respect to the vertebrae known and underlying, with if necessary detachment of osseous chips; moreover, the edges cutting edges 21a of three legs 21 of the heart of body 20 attack the vertebrae to detach from the chips which will supplement the filling of the inner space of body 20; finally the frustoconical form of heart 21 of body 20 ensures, with measurement of its advancing, a compression of part of this osseous material against the walls of the vertebrae, to support the Clerc's Office.

Figures 20 to 23 illustrate a fourth form of performing of the invention, in which body 10 is similar with that of figures 16 to 19, and will not be again described in its unit. It will be observed however that, in this example, single leg 102 of the body is provided of a crossing slit 106, while the other leg is deprived by it. This type of body is used advantageously when one in accordance with the invention uses two implants in a same intervertebral space. In this case, the implants are laid out side-by-side so that the respective slits of the two bodies are inner side, this in order to support fusion with osseous grafts placed in the region of intervertebral space located between the two implants.

The reinforcing member of anchoring 20 present in this case the shape of a threaded plug substantially more short than body 10 in axial direction. This body has a cylindrical heart full 21 provided of a threading 22 adapted to cooperate with net 108 of body 10, of the same manner that previously.

The posterior face of body 20 has a print in hollow 24a for screwing tool, while its anterior face 25 present the shape of a cone in round apex.

The implant according to this form of performing is intended to be used by filling body 10 of osseous grafts with relatively dense way. Way, the penetration of body 20 during the screwing ensures, in addition to the reinforcing of anchoring carried out using threading 22, a compression of the osseous grafts located in body 10, to request them in particular in direction of the known and underlying vertebral trays and to improve fusion.

Figures 24 to 27 illustrate a fifth form of performing of 1 invention. Body 10 of the implant is distinguished from that from the third and fourth forms of performing substantially by the fact that bottom portion 101 has a crossing cylindrical aperture 101a laid out according to the axis of the body, and that the inlet opening located contrary to bottom 101 is deprived of net 108 of the previous performings.

The reinforcing member of anchoring 20 present here the shape of a screw with wide net, which has at its anterior end an extension in the shape of formed shaft of two axial substantially semi-cylindrical tabs 29a, 29b having at their free end an extra thickness, respectively 291a,

291b.

These two tabs have a slightly low outer diameter at the diameter of the opening 101a of body 10, and a reduced thickness so that their resilient deformability allows, previously with the installation by the surgeon, the click-and-ratchet work of body 20 in body 10, the aforementioned body 20 being thus blocked against any free translation but in rotation and being guided on the one hand by the opening 101a, and on the other hand by the inner faces of two legs 102, 103 of body 10.

Another essential feature of this form of performing resides in what body 20 is delimited by two cut or flat sides, respectively 201, 201 ', which confer on the body, in its angular position such as illustrated on figure 24, one thickness substantially equal with thickness of the body 10, and this all along this one.

It is observed also that with the transition between threading 22 (of square section) and the cut sides 201, 201 ', the nets form each one a sharp angle 22a.

In addition, as in some of the previous forms of performing, the proximate portion 24 of body 20 is provided with a print in hollow 24a for a screwing tool.

The installation of the implant by the surgeon is carried out as follows
- the complete implant, i.e. body 10 sheltering body 20 previously retained and to which one has given the angular orientation of figure 24, is engaged by impaction in intervertebral space, this operation being facilitated by the fact that body 20 does not overflow compared to the limits of body 10;
- body 20 is then turned on him same using an appropriate tool engaged in the print 24a, so that the sharp edges of the nets 22 come to attack the osseous material of the vertebral trays suset underlying, while tearing off from this fact of the osseous chips which will fill free spaces existing between body 10 and body 20 to contribute to fusion.

Owing to the fact that body 20 is blocked against any translation compared to body 10, and does not have thus vocation to be screwed in this one or the vertebral trays, one advantageously gives to the nets a 22 substantial lead, so that the action of screwing privileges a reciprocal slip of the nets 22 compared to the vertebral trays, without inducing sufficiently substantial axial effort to move the implant according to this direction.

Now in reference on figures 28 to 32, one will describe a first variant of execution of the third form of performing of the invention described higher in reference on figures 16 to 19. In the description which follows, one will not include the members already described in reference on figures 16 to 19, but only the essential differences brought by the variant.

According to this variant, body 1 is widened and designed to receive two reinforcing members of anchoring, respectively 20a and 20b. For this purpose, body 10 is widened and has two side branches 102 and 103 like plain medial intermediate leg 109 extending between legs 102 and 103.

Legs 102 and 109 define a first housing for the body 20a, while legs 103 and 109 define a second housing for the body 20b, the axes of these two residences being here mutually parallel but being able if necessary to adopt a certain skew. These two residences have the same configuration preferably that the single housing of the third form of performing, and the bodies 20a and 20b are preferably similar to 1 ' body 20 of this same shape of performing.

In the same way, body 10 is provided teeth of osseous anchoring 105, 105 '.

One will observe here, as particularly figures 30 and 31 show it, that the faces upper and low 104 and 10t' of body 10 have a double skew, one corresponding with an approach of these faces in direction of the bottom of the residences, and the other corresponding one with an approach of these faces in a direction lateral (of right towards the left one on figure 30, but the inverse approach being able to be realized while simply turning over body 10 on itself.

This double skew makes it possible body 10 to be established in swash in while restoring lumbar lordosis in the sagittal plane.

In addition, the increased width of the implant makes it possible to ensure a more stable support between the two vertebral trays, while the presence of two reinforcing members of anchoring 20a and 20b makes it possible to reinforce the strength with the slip compared to these trays.

Of course, this variant of performing of the invention can apply to all the other implants described in this memory, single an adaptation of body 10, with the span of the person skilled in the art, being required.

In reference now on figures 33 to 44, one will describe another variant of performing of the implant describes in reference on figures 16 to 19.

According to this variant, the outer body 10 of the implant understands, of the same manner that previously, a general form of U with two side branches 102 and 103 joined together by a wall of distal end 101, with round transitions.

To increase the width of the implant, and thus to improve his stability, it is provided that side branches 102 and 103 present in lateral direction one thickness substantially upper at that of the legs 102 and 103 described in reference at figures 16 to 19.

Preferably, this thickness is selected so as to give to the overall width of the implant an equal value for example with approximately 1,5 to 2,5 times the diameter of the reinforcing member of anchoring 20.

Moreover, to still improve osseous fusion between the known and underlying vertebral trays, one envisages oblong through openings 110 and 111 extending for example vertically between the upper face 104 and the low face 104 ' from the body, so that side branches 102 and 103 have each one a double wall. In each one as of the these walls is in addition spared a generally horizontal oblong opening, respectively 106, 106 ' and 107, 107 ' which make it possible the inner space of body 10 to open laterally on outer body, while crossing the two double walls and through openings 110, 111 respectively.

One observes in addition, as show it figures 43 and 44, that the faces upper and low 104 and 104 ' of the body present one compared to the other a double skew, on the one hand in lateral direction, and on the other hand of the proximate end towards the distal end.

The reinforcing member of anchoring 20 present a construction similar with that which was described in reference on figures 16 to 19. I1 includes/understands an inner fork essentially possessing two legs 21, of which is integral an helical strip 22 formant a net of osseous anchoring, the parts 21 and 22 being preferably realized of only one taking.

The net 22 is preferably here a net self tapper, making it possible to carry out a screwing by attacking the known and underlying vertebral trays directly, without having to previously carry out with the installation a tapping in these vertebral trays. For this purpose, the net 22 present in its distal end region a radial section 22b in the shape of turned tip towards the outer one, and this section varies progressively, for example on the extent of a fraction of turn, until a rectangular radial section 22c. Moreover, the diameter of the net 22 progressively increases its distal end until the aforementioned part of rectangular section which is here of constant diameter.

One observes also that the outer faces of legs 21 present a frustoconical form, whose diameter decreases by the proximate end towards the distal end, at the fine ones further explained.

The two legs are joined together with the level of a casing 24 which present the shape of a cylindrical ring produced preferably of only one taking with the aforementioned legs.

In this casing 24 can be mounted by resilient click-and-ratchet work starting from outer plug 30 which has a series of flexible tabs of locking 33, in the species two pairs of tabs, engaging in the central opening of the casing 24 and whose ends in the shape of teeth 33a can come to cling on the inner edge of the casing 24.

Body 20 and its plug 30 are solidarized together with respect to the rotation by the fact that each pair of tabs 33 comes to closely surround the leader of a respective leg 21 from the fork.

Plug 30 has also a threaded bore 34 laid out centrally and making it possible to receive the end in the shape of threaded ranging of an instrument, known in oneself and not represented, of installation of body 20.

One in addition observes on figures 40 and 44 that two notches diametrically opposite 35, spared on both sides threaded bore 34, make it possible to carry out an angular indexing of the aforementioned instrument, then equipped with complementary installations, compared to plug 30 and thus with the whole of body 20 of reinforcing of anchoring.

One then observes, in particular on figure 44, that net 108 allowing to ensure a co-operation screwed between the outer body 10 and body 20 is envisaged only on one of side branches 102 of the body, in the shape of a reentrant chord ending in a generally straight edge 108a.

Finally one observes, in particular on figures 33, 38 and 40, that the end of the net 22 proximate side is deformed, like designated in 22d, this deformation being carried out in direction of the turn of adjacent net, i.e. towards the distal end.

This deformation makes it possible to confer on the net a 22 function of locking against the reverse rotation, and thus to avoid that the reinforcing member of anchoring 20, after the installation but before osseous fusion, risk to disunite body 10.

The installation of the implant describes above in reference on figures 33 to 44 is carried out with the following successive steps
- first of all, one fills openings 110 and 111 of body 10 of material promoter of osseous growth, such as osseous grafts
- after distraction so required, one inserts then the body in the species intervertebral;
- one fills body 20 with reinforcing of anchoring avee a material promoter of osseous growth, then one closes this body 20 at his proximate end by click-and-ratchet work of plug 30;
- by screwing, one engages the aforementioned body in the previously laid body; it is to be noted here that the frustoconical form of two legs 21 of the fork of body 20 allows, measurement of the advancing of body 20, to compress the material of osseous growth and thus to ensure a good contact on the one hand with the known and underlying vertebral trays, and on the other hand with the material of osseous growth previously placed in openings 110 and 111, via openings 108 and 109.

The implants in accordance with the invention are obviously made out of a biocompatible material of appropriate stiffness, such as a titanium alloy or a stainless steel.

In a beneficial way, one in accordance with the invention proposes to the surgeon implants in the form of a set of implants of forms and of different size, which make it possible to choose the implant, and in particular body 10, the best adapt one with the morphology of the site of installation.

In particular, one can envisage implants
- whose bodies 10 have different heights, with in this case of the reinforcing members of anchoring 20 whose diameters can evolve/move to adapt to these different heights,
- whose bodies have different widths; thus one can envisage, in the particular case of the third form of performing, a range of implants whose widths vary progressively between a minimum width (case of figures 16 to 19) and a maximum width (for example as represented on figures 33 to 44), while varying the thickness in lateral direction of side branches 102 and 103 of the body, while preserving the same size of inner space and thus while being able to use same body 20 in all the cases advantageously, these side branches 102, 103 pass from a single wall (figures 16 to 19) to a double wall (figures 33 to 44) as soon as the thickness of the aforesaid legs 102, 103 became sufficient to make it possible to practise the vertical through openings 110 and 111 I
- whose bodies present upper and low faces of different mutual slopes, as well of before worms back as laterally, with bodies 20 of identical or different diameters
- of which body 10 and/or the reinforcing members of anchoring 20 present different lengths
- whose reinforcing members of anchoring present different projections of anchoring, and in particular more or less deep and more or less spaced, according to the mechanical characteristics met with the level of the vertebral trays; etc

Of course, the present invention is by no means limited to the forms of performing described above and illustrated on the drawings, but the person skilled in the art will be able to bring any variant or modifying in conformity there with his spirit, and in particular to combine between them the features of the various described forms of performing.

In addition, the projections of osseous anchoring as described higher can be consisted by any means making it possible to ensure a mechanical anchoring and/or osseous connection with the known and underlying vertebral trays. In particular, it can be a question of porous coating or hydroxyapatite.

Result Page

CLAIMS

1. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned possessing hollow body of the provided surfaces upper and low teeth with sharp edges adapted to be anchored in the aforementioned vertebrae in order toto oppose to the inverse movement of the aforesaid body out of the aforesaid intervertebral space.

2. Implant according to the claim 1, in which the aforementioned teeth present a triangular cross-section.

3. an implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned lateral walls of the hollow body is partially cylindrical and coaxial with an axis of the aforesaid reinforcing member of anchoring.

4. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned lateral walls has through openings authorizing an osseous growth through them.

5. Implant according to the claim 4, in which the aforementioned openings include/understand elongated slits extending substantially parallel to the direction from insertion of the aforesaid body in the aforementioned hollow body.

6. Implant according to the claim 4, in which the lateral walls of the body are thick walls in which second through openings are formed extending between the faces upper and low body.

7. Implant according to the claim 6, in which the aforementioned crossing first apertures put in communication the aforementioned inner space with the aforementioned second through openings.

8. Implant according to the claim 6, in which it is envisaged through openings putting in communication the aforementioned second through openings with the outer sides of the body.

9. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned hollow body has a wall of distal end connecting the aforementioned lateral walls, the aforementioned wall of distal end being round to facilitate itinsertion of the aforesaid hollow body in the aforementioned intervertebral space.

10. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned hollow body has a wall of distal end connecting the aforementioned lateral walls, the aforementioned wall of distal end possessing a tapped hole for temporary fixing of the aforesaid hollow body with an instrument of insertion of the body.

11. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a threading of screw autotaraudor.

▲ top

12. Implant according to the claim 11, in which the aforementioned threading of present screw a generally quadrangular radial section.

13. Implant according to the claim 12, in which the aforementioned threading of present screw a radial section which pass progressively of a substantially triangular radial section with the aforementioned generally quadrangular radial section starting from the distal end of the aforesaid threading.

14. Implant according to the claim 11, in which the diameter of the threading of screw increases progressively starting from its distal end until a diameter portion substantially constant.

15. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a threading of screw in the shape of a helical strip encircling an inner space of the aforesaid body of reinforcing of anchoring.

16. Implant according to the claim 15, in which the aforementioned helical strip is connected to a fork extending inside the aforementioned strip in an axial direction of the aforesaid body.

17. Implant according to the claim 16, in which the aforementioned fork includes/understands two legs extending starting from a wall from proximate end of the aforesaid reinforcing member from anchoring.

18. Implant according to the claim 16, in which the aforementioned fork includes/understands legs presenting an outer surface in the form of part of truncated cone whose diameter decreases by the proximate end towards the distal end of the body.

19. Implant according to the claim 16, in which the aforementioned fork includes/understands at least two legs possessing each one an edge cutting edge of driver of the bone.

20. Implant according to the claim 16, in which the helical fork and strip are carried out of only one taking.

21. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring about its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, in which the aforementioned projections of osseous anchoring include/understand a threading of screw, and in which the aforementioned body has locking means of this one against one reverse rotation.

22. Implant according to the claim 21, in which the aforementioned projections of osseous anchoring include/understand a threading of screw and the aforementioned locking means include/understand a deformed portion of the aforesaid threading in the region of its proximate end.

23. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a possessing threading of screw an outer diameter which decreases in its distal region towards its distal end.

24. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has a wall of proximate end adapted with substantially closing a front opening of the aforesaid body hollow, so thata substance promoter of osseous growth placed inside the said body is compressed pendent insertion of the aforesaid body in the aforementioned hollow body.

25. Implant according to the claim 24, in which the aforementioned reinforcing member of anchoring has at least a part of which the outer surface belongs to a truncated cone.

26. Implant according to the claim 24, in which the aforementioned reinforcing member of anchoring is substantially more short than the body and has a generally conical tip directed towards the aforementioned wall of distal end of the body.

27. Implant according to the claim 24, in which the aforementioned wall of proximate end has an opening tapped for temporary fixing of the aforesaid body with an instrument of insertion of the body.

28. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has indexing means to fix the aforementioned body at an instrument of insertion of the body in one given angular relationship.

29. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which

define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring hollow on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has at its proximate end a brought back plug.

30. Implant according to the claim 29, in which the aforementioned plug is screwed in a tapped front opening of the reinforcing member of anchoring.

31. Implant according to the claim 29, in which the aforementioned plug is engaged by resilient click-and-ratchet work in a front opening of the reinforcing member of anchoring.

32. Implant according to the claim 29, in which the aforementioned plug has an installation adapted to cooperate with an instrument making it possible to involve the body in rotation.

33. Implant according to the claim 29, in which the aforementioned plug has angular adjustment of indexing of the reinforcing member of anchoring with an instrument of installation of the aforesaid body.

34. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a threading of screw, and at least one of the side branches of the body has a reentrant part forming net adapted to cooperate with the aforementioned threading.

35. Implant according to the claim 34, in which the aforementioned reentrant part is envisaged only on one of the legs and constitutes the single body part cooperating by screwing with threading of screw.

36. Implant according to the claim 35, in which the aforementioned present reentrant part a substantially straight free end edge.

37. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned body is directed into oblique compared to a plane of the corresponding body to the sagittal plane.

38. Implant according to the claim 21, in which the reinforcing member of anchoring is directed to approximately 450 compared to a plane of the corresponding body to the sagittal plane.

39. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring hollow on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which through openings is envisaged in the aforementioned body between the inner one and the outer one of this one, the aforementioned openings being elongated in one substantially circumferential direction of the body.

40. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned body has a wall of distal end, and the aforementioned reinforcing member of anchoring has a distal end portion adapted with to be screwed in an opening of the aforesaid the wall of distal end.

41. Implant according to the claim 40, in which the aforementioned body has a wall of proximate end also including an opening wider than outer dimension of the aforesaid reinforcing member of anchoring and in which the aforementioned body can be freely committed.

42. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the body present a proximate wall, a distal wall and two lateral walls, the aforementioned walls defining between them an inner space more large that the aforementioned reinforcing member of anchoring.

43. Implant according to the claim 42, in which the aforementioned reinforcing member of anchoring has a threaded portion for its screwing in the proximate wall of the body.

44. Implant according to the claim 42, in which the aforementioned reinforcing member of anchoring and the distal wall of the body mutually has means threaded cooperating for fixing of the aforesaid body with the body.

45. Implant according to one of the claims 43 and 44, in which the aforementioned projections of osseous anchoring include/understand a threading of screw having the same step as the aforementioned threaded portion of fixing to the body.

46. Implant according to claim 42, in which the lateral walls and the proximate wall of the body extend substantially on a same circular arc, and the aforementioned distal wall is substantially straight.

47. Implant according to the claim 42, in which the faces upper and low of the body have projections of osseous anchoring extending along its walls.

48. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which means is planned for the rotating mounting of the reinforcing member of anchoring in the inner space of the body while preventing one translational motion relative between those.

49. Implant according to the claim 48, in which the mounting means include/understand a formed cylindrical aperture in a wall of distal end of the aforesaid body and a shaft envisaged on the aforementioned body and adapted to be engaged by resilient deformation in the aforementioned opening.

50. Implant according to the claim 48, in which the aforementioned reinforcing member of anchoring present the shape of a screw possessing two flat diametrically opposite, the aforementioned projections of osseous anchoring being defined between the aforementioned flat and of the edges cutting edges being envisaged with the transitions between the threading of the screw and the flat ones.

51. Implant according to the claim 50, in which the distance between the flat opposite ones is not upper at the distance between the faces upper and low of the aforesaid body.

52. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a whole of generally parallel walls defining at least two inner spaces located side-by-side and exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover at least two reinforcing members of possessing anchoring about their outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned bodies being adapted to be involved in rotation in respective inner spaces of the aforesaid body.

53. Implant according to the claim 52, in which the aforementioned bodies are identical.

54. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned hollow body has surfaces upper and low which is inclined one compared to the other, with a distance between them which decreases proximate end towards the distal end of the body.

55. An implant for the surgery of the rachis, comprising a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of lateral walls surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned comprising implant moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned body being adapted to be involved in rotation in the inner space of the body, and in which the aforementioned hollow body has surfaces upper and low which is inclined one compared to the other, with a distance between them which decreases of a lateral first side of the body towards the opposite lateral side.

56. A set of implants to form a rachidian implant intended to be inserted in an intervertebral space of the human spine while being adapt with the geometry of the aforesaid intervertebral space, the aforementioned comprising play
a plurality of hollow body possessing each one a pair of walls lateral delimiting an inner space and adapted each one to be inserted in an intervertebral space in such a way that the aforementioned inner space is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, each one of the aforesaid body having a specific size and a form,
at least a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the bodies, the aforementioned body being adapted to be involved in rotation in the inner space of any of the aforesaid body,
so that a specific hollow body suitable with the particular configuration of a given intervertebral space can be selected among the aforementioned plurality of hollow body.

57. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of possessing hollow body different angles of inclination between their upper and low surfaces.

58. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body having different widths.

59. Set of implants according to the claim 58, in which the widest bodies hollow present lateral walls in which through openings are formed extending between the upper and low faces of the aforesaid body.

60. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body having different heights.

61. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body presenting different lengths.

62. Set of implants according to the claim 56, in which a determined group of hollow body of the aforesaid plurality is adapted to receive a same type of reinforcing member of anchoring.

63. Method to position in an intervertebral space of an human spine a comprising implant a possessing substantially hollow body a pair of lateral walls surrounding an inner space and a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of

osseous anchoring in an upper diameter with the overall height of the body and adapted to be involved in rotation in the inner space of the body, the aforementioned comprising method following steps
to select starting from a set of possessing hollow body different forms and dimensions an hollow body adapt with the configuration of the aforesaid intervertebral space
to fill the aforementioned hollow body selected with a substance promoter of osseous growth
to push the aforementioned hollow body in the aforementioned intervertebral space in such a way that the inner space of this one is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space; and
to insert the aforementioned reinforcing member of anchoring in the aforementioned hollow body in such a way that the aforementioned projections of osseous anchoring are anchored in the aforementioned vertebrae suset underlying.

64. Process according to claim 63, for the positioning of an implant of which the body present of the provided lateral walls of through openings extending between the faces upper and low of the aforesaid body, comprising moreover, before the step of push of the aforesaid hollow body in the aforementioned spaced intervertebral, a filling step of the aforesaid through openings with a substance promoter of osseous growth.

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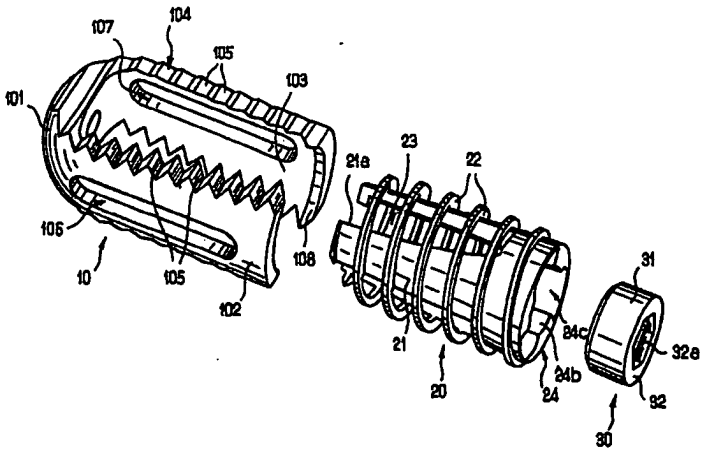
(54) Title: TWO–PART INTERSOMATIC IMPLANT

(54) Titre: IMPLANTS INTERSOMATIQUES EN DEUX PARTIES



(57) Abstract

The invention concerns an implant for backbone surgery essentially comprising a hollow body (10) to be inserted in an intervertrebral space, said body having a pair of lateral walls (102, 103) enclosing an internal space exposed to the superjacent and subjacent vertebrae defining said intervertebral space. The implant further comprises an anchoring reinforcement member (20) having on its outer surface bone anchoring projections (22) inscribed in a diameter greater than the body overall height, said member being driven in rotation in the inner space of the body. The invention concerns various improvements to such a two–part implant.

(57) Abrégé

Un implant pour la chirurgie du rachis comprend un corps (10) essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales (102, 103) entourant un espace intérieur exposé aux vertèbres sus– et sous–jacentes qui définissent ledit espace intervertébral. L'implant comprend en outre un organe de renforcement d'ancrage (20) possédant sur sa surface extérieure des saillies (22) d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors–tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps. L'invention propose différents perfectionnements à un tel implant en deux parties.

IMPLANTS INTERSOMATIQUES EN DEUX PARTIES

La présente invention a trait d'une façon générale aux implants intersomatiques utilisables dans le traitement chirurgical du rachis.

On connaît déjà de très nombreux implants intersomatiques.

On connaît en particulier des implants de structure plus ou moins complexe, réalisées en plusieurs parties notamment pour leur conférer certaines caractéristiques de déformabilité. Ces implants connus sont désavantageux en ce qu'ils sont plus coûteux et difficiles à fabriquer, et que leur pose s'avère plus délicate. Ils peuvent souffrir également d'un problème de fiabilité à terme.

On connaît également des implants qui, afin notamment de pallier tout ou partie des inconvénients ci-dessus, présentant la forme de corps creux monobloc, ou cages, munis d'aspérités sur leurs faces supérieure et postérieure pour assurer un bon blocage initial par rapport aux plateaux vertébraux sus-jacent et sous-jacent, leur caractère creux permettant une croissance osseuse à travers eux et, à terme, leur blocage définitif.

Le document FR-A-2 703 580 décrit un exemple d'un tel implant.

Ces implants monobloc connus, malgré la présence d'aspérités qui viennent s'ancrer dans les plateaux vertébraux lorsque la distraction intervertébrale nécessaire à leur mise en place est supprimée, peuvent présenter dans certains cas une stabilité insuffisante, la qualité de l'ancrage, qui s'effectue par un simple mouvement de translation, étant tributaire notamment de

la dureté des os.

On connaît également par le document DE-U- un implant qui comporte un corps extérieur dans lequel peut être engagé par vissage un élément intérieur de renforcement d'ancrage, dont les filets débordent au-dessus et au-dessous des faces supérieure et inférieure de ce corps extérieur.

La présente invention vise à améliorer ce type d'implant connu.

RESUME DE L'INVENTION

Un implant pour la chirurgie du rachis comprend un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral. L'implant comprend en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps.

Pour s'opposer au mouvement inverse dudit corps hors dudit espace intervertébral, et donc améliorer encore le maintien de l'implant en position, ledit corps creux possède des surfaces supérieure et inférieure pourvues de dents à bords vifs aptes à être ancrées dans lesdites vertèbres.

De préférence, lesdites dents présentent une section transversale triangulaire.

Selon un autre aspect, pour améliorer la compacité de l'implant et faciliter sa mise en place, lesdites parois latérales du corps creux sont partiellement cylindriques et coaxiales avec un axe dudit organe de renforcement d'ancrage.

Selon un autre aspect encore, pour favoriser la croissance osseuse à l'extérieur de l'implant, en particulier latéralement, lesdites parois latérales possèdent des ouvertures traversantes autorisant une croissance osseuse à travers elles.

Avantageusement, ces ouvertures comprennent des fentes allongées s'étendant essentiellement parallèlement à la direction d'insertion dudit organe dans ledit corps creux.

Pour donner au corps une plus grande largeur, on peut utiliser pour les parois latérales du corps des parois épaisses dans lesquelles sont formées des secondes ouvertures traversantes s'étendant entre les faces supérieure et inférieure du corps. Une croissance osseuse peut également être provoquée entre les deux plateaux vertébraux à travers ces secondes ouvertures traversantes.

Préférentiellement, lesdites premières ouvertures traversantes mettent en communication ledit espace intérieur avec lesdites secondes ouvertures traversantes.

On peut prévoir en outre des ouvertures traversantes mettant en communication lesdites secondes ouvertures traversantes avec les côtés extérieurs du corps.

Selon un autre aspect de l'invention, le corps creux possède une paroi d'extrémité distale reliant lesdites parois latérales, et cette paroi d'extrémité

distale est arrondie pour faciliter l'insertion dudit corps creux dans ledit espace intervertébral.

L'invention propose également un implant tel que défini plus haut, dans lequel le corps creux possède une paroi d'extrémité distale reliant lesdites parois latérales, et cette paroi d'extrémité distale possède un trou taraudé pour la fixation temporaire dudit corps creux à un instrument d'insertion du corps, pour ainsi faciliter sa mise en place par le chirurgien.

Selon un autre aspect, lesdites saillies d'ancrage osseux comprennent un filetage de vis autotaraudeur.

Ce filetage peut présenter une section radiale généralement quadrangulaire.

Préférentiellement, ce filetage de vis présente une section radiale qui passe progressivement d'une section radiale essentiellement triangulaire à ladite section radiale généralement quadrangulaire à partir de l'extrémité distale dudit filetage, tandis que le diamètre du filetage de vis augmente progressivement à partir de son extrémité distale jusqu'à une partie de diamètre essentiellement constant.

On propose également selon l'invention un implant dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis sous la forme d'une bande en hélice encerclant un espace intérieur dudit organe de renforcement d'ancrage.

Cette bande en hélice est avantageusement reliée à une fourche s'étendant à l'intérieur de ladite bande dans une direction axiale dudit organe, et cette fourche comprend de préférence deux branches s'étendant à partir d'une paroi d'extrémité proximale dudit organe de renforcement d'ancrage.

La fourche peut comprendre également des branches présentant une surface extérieure en forme de partie de tronc de cône dont le diamètre diminue de l'extrémité proximale vers l'extrémité distale de l'organe. Ceci permet de comprimer une substance promotrice de croissance osseuse préalalement placée dans l'organe de renforcement d'ancrage, lors du vissage de ce dernier.

En variante, la fourche comprend au moins deux branches possédant chacune un bord tranchant d'attaque de l'os pour ainsi accumuler des copeaux d'os à l'intérieur de l'organe 20 et faciliter la fusion osseuse.

Il est préférable que la fourche et la bande en hélice soient réalisées d'un seul tenant.

L'invention propose également un implant dans lequel les saillies d'ancrage osseux comprennent un filetage de vis, et dans lequel ledit organe possède des moyens de blocage de celui-ci contre une rotation inverse. Préférentiellement, ces moyens de blocage comprennent une partie déformée dudit filetage dans la région de son extrémité proximale. On améliore ainsi la tenue de l'implant jusqu'à ce que la fusion soit réalisée.

Selon un autre aspect, les saillies d'ancrage osseux comprennent un filetage de vis possédant un diamètre extérieur qui diminue dans sa région distale vers son extrémité distale, pour faciliter la pénétration de ce filetage dans les plateaux vertébraux.

Par ailleurs on propose que ledit organe de renforcement d'ancrage possède une paroi d'extrémité proximale apte à essentiellement fermer une ouverture frontale dudit corps creux, de telle sorte qu'une substance promotrice de croissance osseuse placée à

l'intérieur dudit organe soit comprimée pendant l'insertion dudit organe dans ledit corps creux.

Dans ce cas, l'organe de renforcement d'ancrage possède au moins une partie dont la surface externe appartient à un tronc de cône. En variante, l'organe de renforcement d'ancrage est sensiblement plus court que le corps et possède une pointe généralement conique dirigée vers ladite paroi d'extrémité distale du corps.

Il est avantageux dans ce cas que la paroi d'extrémité proximale de l'organe possède une ouverture taraudée pour la fixation temporaire dudit organe à un instrument d'insertion de l'organe.

Selon un autre aspect encore, l'invention propose un implant tel que défini plus haut, dans lequel l'organe de renforcement d'ancrage possède des moyens d'indexation pour fixer ledit organe à un instrument d'insertion de l'organe dans une relation angulaire donnée.

Selon une autre caractéristique, l'organe de renforcement d'ancrage possède à son extrémité proximale un bouchon rapporté, qui peut par exemple être vissé dans une ouverture frontale taraudée de l'organe de renforcement d'ancrage, ou encore engagé par encliquetage élastique dans une ouverture frontale de l'organe de renforcement d'ancrage.

Il est avantageux que ce bouchon possède un aménagement apte à coopérer avec un instrument permettant d'entraîner l'organe en rotation, et/ou des aménagements d'indexation angulaire de l'organe de renforcement d'ancrage avec un instrument de pose dudit organe.

On propose également selon l'invention que les saillies d'ancrage osseux comprennent un filetage de vis, et qu'au moins l'une des branches latérales du corps

possède une partie rentrante formant filet apte à coopérer avec ledit filetage.

Cette partie rentrante peut être prévue seulement sur l'une des branches et constituer alors la seule partie du corps coopérant par vissage avec le filetage de vis.

En outre, cette partie rentrante peut présenter un bord d'extrémité libre essentiellement rectiligne.

Selon un autre aspect, l'invention propose un implant dans lequel ledit organe est orienté en oblique, par exemple à environ 45°, par rapport à un plan du corps correspondant au plan sagittal.

Selon un autre aspect, il est proposé que des ouvertures traversantes soient prévues dans ledit organe entre l'intérieur et l'extérieur de celui-ci, lesdites ouvertures étant allongées dans une direction essentiellement circonférentielle de l'organe.

Selon un aspect encore différent, le corps possède une paroi d'extrémité distale, et l'organe de renforcement d'ancrage possède une partie d'extrémité distale apte à être vissée dans une ouverture de ladite paroi d'extrémité distale.

Le corps peut posséder également dans ce cas une paroi d'extrémité proximale incluant une ouverture plus large que la dimension extérieure dudit organe de renforcement d'ancrage et dans laquelle ledit organe peut être engagé librement.

L'invention propose par ailleurs un implant dans lequel le corps présente une paroi proximale, une paroi distale et deux parois latérales, lesdites parois définissant entre elles un espace intérieur plus grand que ledit organe de renforcement d'ancrage. On accroît

ainsi l'espace affecté à la croissance osseuse entre les plateaux vertébraux sus- et sous-jacents.

Dans ce cas, l'organe de renforcement d'ancrage peut posséder une partie filetée pour son vissage dans la paroi proximale du corps, ou bien ledit organe de renforcement d'ancrage et la paroi distale du corps peuvent posséder des moyens filetés coopérant mutuellement pour la fixation dudit organe au corps.

Dans une telle configuration, les saillies d'ancrage osseux peuvent comprendre un filetage de vis ayant le même pas que ladite partie filetée ou les moyens filetés de fixation au corps.

La forme du corps, dans ce cas, est de préférence telle que les parois latérales et la paroi proximale du corps s'étendent essentiellement sur un même arc de cercle, et que ladite paroi distale soit essentiellement rectiligne.

Il est également avantageux que les faces supérieure et inférieure du corps possèdent des saillies d'ancrage osseux s'étendant le long de ses parois.

Il est également prévu selon l'invention un implant pourvu de moyens pour le montage à rotation de l'organe de renforcement d'ancrage dans l'espace intérieur du corps tout en empêchant un mouvement de translation relative entre ceux-ci.

Ces moyens de montage comprennent avantageusement une ouverture cylindrique formée dans une paroi d'extrémité distale dudit corps et un arbre prévu sur ledit organe et apte à être engagé par déformation élastique dans ladite ouverture.

Dans ce cas particulier, ledit organe de renforcement d'ancrage présente préférentiellement la

forme d'une vis possédant deux plats diamétralement opposés, lesdites saillies d'ancrage osseux étant définies entre lesdits plats et des bords tranchants étant prévus aux transitions entre le filetage de la vis et les plats pour ainsi favoriser la fusion osseuse après la pose de l'implant.

Pour faciliter l'insertion de l'implant, la distance entre les plats opposés n'est pas supérieure à la distance entre les faces supérieure et inférieure dudit corps.

Selon un autre aspect de l'invention, on propose un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant un ensemble de parois généralement parallèles définissant au moins deux espaces intérieurs situés côte-à-côte et exposés aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre au moins deux organes de renforcement d'ancrage possédant sur leur surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, lesdits organes étant aptes à être entraînés en rotation dans des espaces intérieurs respectifs dudit corps.

Avantageusement, lesdits organes sont identiques.

L'invention prévoit par ailleurs que le corps creux puisse posséder différentes géométries, et en particulier :

- des surfaces supérieure et inférieure qui sont inclinées l'une par rapport à l'autre, avec une distance entre elles qui diminue de l'extrémité proximale vers l'extrémité distale du corps ; et/ou

- des surfaces supérieure et inférieure qui sont inclinées l'une par rapport à l'autre, avec une distance entre elles qui diminue d'un premier côté latéral du corps vers le côté latéral opposé.

L'invention propose par ailleurs un jeu d'implants pour former un implant rachidien destiné à être inséré dans un espace intervertébral de la colonne vertébrale humaine en étant adapté à la géométrie dudit espace intervertébral. Ce jeu d'implants comprend :

une pluralité de corps creux possédant chacun une paire de parois latérales délimitant un espace intérieur et aptes chacun à être inséré dans un espace intervertébral de telle manière que ledit espace intérieur soit exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, chacun desdits corps ayant une taille et une forme spécifiques,

au moins un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout des corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur de l'un quelconque desdits corps,

de telle sorte qu'un corps creux spécifique convenant à la configuration particulière d'un espace intervertébral donné puisse être choisi parmi ladite pluralité de corps creux.

Les tailles et formes spécifiques des corps peuvent résulter en particulier :

- de différents angles d'inclinaison entre leurs surfaces supérieures et inférieures.

- de différentes largeurs ; dans ce cas, les corps creux les plus larges présentent avantageusement des

parois latérales dans lesquelles sont formées des ouvertures traversantes s'étendant entre les faces supérieures et inférieures desdits corps ;

- de différentes hauteurs.
- de différentes longueurs.

Préférentiellement, un groupe déterminé de corps creux de ladite pluralité est apte à recevoir un même type d'organe de renforcement d'ancrage.

L'invention propose enfin un procédé pour positionner dans un espace intervertébral d'une colonne vertébrale humaine un implant comprenant un corps essentiellement creux possédant une paire de parois latérales entourant un espace intérieur et un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps et apte à être entraîné en rotation dans l'espace intérieur du corps, ledit procédé comprenant les étapes suivantes :

sélectionner à partir d'un jeu de corps creux possédant différentes formes et dimensions un corps creux adapté à la configuration dudit espace intervertébral ;

remplir ledit corps creux sélectionné avec une substance promotrice de croissance osseuse ;

pousser ledit corps creux dans ledit espace intervertébral de telle manière que l'espace intérieur de celui-ci soit exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral ; et

insérer ledit organe de renforcement d'ancrage dans ledit corps creux de telle manière que lesdites saillies d'ancrage osseux s'ancrent dans lesdites vertèbres sus- et sous-jacente.

Dans le cas où l'on souhaite positionner un implant

dont le corps présente des parois latérales pourvues d'ouvertures traversantes s'étendant entre les faces supérieure et inférieure dudit corps, le procédé peut comprendre en outre, avant l'étape de poussée dudit corps creux dans ledit espacé intervertébral, une étape de remplissage desdites ouvertures traversantes avec une substance promotrice de croissance osseuse.

BREVE DESCRIPTION DES DESSINS

D'autres aspects, buts et avantages de la présente invention apparaîtront mieux à la lecture de la description détaillée suivante de formes de réalisation préférées de celle-ci, donnée à titre d'exemple et faite en référence aux dessins annexés, sur lesquels :

la figure 1 est une vue en perspective d'un implant selon une première forme de réalisation de l'invention,

la figure 2 est une vue de profil de l'implant de la figure 1 placé entre deux plateaux vertébraux,

la figure 3 est une vue de face de l'implant de la figure 1,

la figure 4 est une vue de dessus de l'implant des figures 1 et 3,

la figure 5 est une vue de côté d'un élément de l'implant de la figure 1,

la figure 6 est une vue en bout selon la flèche VI de la figure 5,

la figure 7 est une vue en bout selon la flèche VII de la figure 5,

la figure 8 est une vue en perspective de l'élément des figures 5 à 7,

la figure 9 est une vue en perspective d'un implant

selon une seconde forme de réalisation de l'invention,

la figure 10 est une vue de face de l'implant de la figure 9,

la figure 11 est une vue de dessus de l'implant des figures 9 et 10,

la figure 12 est une vue de dessus d'un premier élément de l'implant des figures 9 à 11,

la figure 13 est une vue de côté d'un second élément de l'implant des figures 9 à 11,

la figure 14 est une vue en bout selon la flèche XIV de la figure 13,

la figure 15 est une vue en bout selon la flèche XV de la figure 13,

la figure 16 est une vue en perspective éclatée d'un implant selon une troisième forme de réalisation de l'invention,

la figure 17 est une vue de côté de l'implant de la figure 16, assemblé,

la figure 18 est une vue selon la flèche XIIX de la figure 17,

la figure 19 est une vue selon la flèche XIX de la figure 17,

la figure 20 est une vue en perspective éclatée d'un implant selon une quatrième forme de réalisation de l'invention,

la figure 21 est une vue de côté de l'implant de la figure 20, assemblé,

la figure 22 est une vue selon la flèche XXII de la figure 21,

la figure 23 est une vue selon la flèche XXIII de la figure 21,

la figure 24 est une vue en perspective éclatée d'un

implant selon une cinquième forme de réalisation de l'invention,

la figure 25 est une vue de côté de l'implant de la figure 24, assemblé,

la figure 26 est une vue selon la flèche XXVI de la figure 25,

la figure 27 est une vue selon la flèche XXVII de la figure 25,

la figure 28 est une vue en perspective éclatée d'un implant selon une variante de la troisième forme de réalisation de l'invention,

la figure 29 est une vue en perspective de l'implant de la figure 28 à l'état assemblé,

la figure 30 est une vue de l'arrière de l'implant de la figure 29,

la figure 31 est une vue de côté de l'implant de la figure 29,

la figure 32 est une vue de dessus de l'implant de la figure 29,

la figure 33 est une vue en perspective, avant assemblage, d'une variante d'exécution de la troisième forme de réalisation de l'invention,

les figures 34 à 36 sont trois vues en perspective du corps de cette variante d'exécution,

la figure 37 est une vue en bout, côté distal, de ce même corps,

la figure 38 est une vue en perspective de l'organe de renforcement d'ancrage de cette variante d'exécution,

la figure 39 est une vue en élévation de côté de ce même organe de renforcement d'ancrage,

les figures 40 et 41 sont deux vues en perspective de l'implant selon cette même variante, à l'état

assemblé,

la figure 42 est une vue de dessus de ce même implant assemblé,

la figure 43 est une vue en élévation de côté de ce même implant assemblé, et

la figure 44 est une vue en bout, côté proximal, de ce même implant assemblé.

DESCRIPTION DETAILLEE DE FORMES DE REALISATION

On notera préliminairement que, d'une figure à l'autre, des éléments ou parties identiques ou similaires sont désignés dans la mesure du possible par les mêmes signes de référence.

On notera également que les termes « proximal » et « distal » utilisés tout au long de la présente description correspondent respectivement à l'extrémité de l'implant du côté le plus proche du chirurgien au cours des opérations de pose, et à l'extrémité de l'implant la plus éloignée du chirurgien.

En référence tout d'abord aux figures 1 à 8, on a représenté un implant de type cage intersomatique qui est constitué de deux parties, à savoir un corps 10 et un organe de renforcement d'ancrage 20.

Le corps 10 présente la forme générale d'un anneau, avec une face supérieure 11, une face inférieure 12, une face interne 13 et une face externe 14.

Le contour du corps 10 présente une forme circulaire tronquée par une partie de contour rectiligne, sa largeur étant par exemple égale à environ quatre tiers de sa profondeur.

Le long de la partie de contour rectiligne, sur les

faces supérieure et inférieure 11 et 12, sont ménagées des aspérités pour assurer un blocage de l'implant par rapport aux plateaux vertébraux sus-jacent V1 et sous-jacent V2 (voir figure 2) lorsque l'implant sera comprimé entre celles-ci.

Ces aspérités présentent en l'espèce la forme de trois nervures supérieures 11b et de trois nervures inférieures 12b, de section triangulaire et de trajectoires circulaires concentriques suivant la partie de contour circulaire du corps.

A l'opposé de la partie de contour rectiligne, le corps possède une paroi plus épaisse, matérialisée par des plages supérieure 11a et inférieure (non référencée).

Dans cette partie de paroi est ménagé un orifice traversant taraudé 18 dont l'axe s'étend en oblique, et de préférence à environ 45°, par rapport au plan vertical perpendiculaire à la paroi distale plane de l'implant, plan vertical qui correspond au plan sagittal.

En outre, l'axe de cet orifice 18, qui s'étend essentiellement horizontalement, passe sensiblement par le centre de la partie de contour circulaire, en se dirigeant vers la région opposée située à la transition entre la partie de contour circulaire et la partie de contour rectiligne.

L'implant selon l'invention comprend en outre un organe 20 destiné à conforter l'ancrage réalisé au niveau des plateaux vertébraux.

Cet organe présente dans cet exemple la forme d'une âme cylindrique creuse 21 à la surface extérieure duquel est ménagé un filet hélicoïdal 22 qui est complémentaire du taraudage formé au niveau de l'orifice 18.

Entre les sections de filet adjacentes sont ménagées

une pluralité d'ouvertures 23 oblongues dans la direction de l'hélice du filet, à des fins expliquées plus loin.

A son extrémité distale, l'organe 20 est fermé par une paroi pleine 25. Au voisinage de sa face opposée définissant son extrémité proximale, il comporte une partie pleine 24 dans laquelle est formée une empreinte en creux 24a, par exemple de section hexagonale, pour l'introduction d'un outil de vissage (non représenté).

Il est important de noter, comme le montre en particulier la figure 3, que le diamètre hors-tout D dans lequel s'inscrit le filet 22 de l'organe 20 est légèrement supérieur à la hauteur hors-tout H dans laquelle s'inscrit le corps 10, ceci à des fins expliquées plus loin.

On observera ici que la longueur de l'organe 20 est telle qu'il peut être vissé dans l'orifice 18 du corps 10 jusqu'à ce que la face extérieure de sa partie pleine proximale 24 vienne sensiblement dans le prolongement de la face extérieure 14 du corps 10 avoisinant ledit orifice.

On va maintenant expliquer l'utilisation d'un implant tel que décrit ci-dessus. On observera que le même type de procédure, avec les adaptations nécessaires, sera pratiquée pour les autres formes de réalisation, décrites plus loin, des implants selon l'invention.

Une distraction étant préalablement opérée entre deux vertèbres à traiter, par des moyens bien connus en eux-mêmes, le disque intervertébral est enlevé au moins partiellement et le corps 10 de l'implant, dépourvu de son organe 20, est mis en place, par voie antérieure ou postérieure. Avantageusement, l'espace intérieur du corps est préalablement rempli de greffons osseux, afin

d'assurer à terme une fusion intervertébrale par ostéogenèse.

On observera ici que le contour du corps 10, avec le pan coupé en partie proximale, est tel qu'il s'inscrit bien dans la surface d'un plateau vertébral. Si nécessaire, on peut proposer au chirurgien différentes tailles de corps 10, à choisir en fonction de la morphologie rachidienne du patient, comme on le verra en détail plus loin.

Les deux vertèbres sont alors libérées, et un premier blocage du corps entre les plateaux vertébraux V1 et V2 est assuré à l'aide des nervures 11b, 12b.

L'organe 20 est alors vissé à l'aide d'un outil dans l'orifice 18. Au cours de ce mouvement, la partie sommitale du filet 22, qui déborde légèrement vers le haut et vers le bas par rapport aux parties sommitales des nervures 11b, 12b, entaille les faces en vis-à-vis des plateaux vertébraux sus-jacent et sous-jacent à la manière d'une vis auto-taraudeuse, et réalise ainsi un ancrage supplémentaire qui vient fermement bloquer l'implant par rapport à ces plateaux.

En outre, la rotation de l'organe 20 à mesure qu'il pénètre dans l'espace intérieur, rempli de greffons osseux, du corps 10, fait qu'une partie de ces greffons va migrer à travers les ouvertures 23 jusque dans l'espace intérieur de l'organe creux 20. La croissance osseuse va donc également se produire à travers l'organe 20, ce qui va avantageusement bloquer l'organe 20 vis à vis de toute rotation notamment inverse risquant d'affecter à terme la tenue de l'implant. En variante, on peut prévoir également que l'organe 20 soit préalablement rempli de greffons osseux.

Les figures 9 à 15 illustrent une seconde forme de réalisation de la présente invention.

Sur ces figures, des éléments ou parties identiques ou similaires à ceux des figures 1 à 8 sont désignés par les mêmes signes de référence, et l'on décrira seulement les différences de cette seconde forme de réalisation par rapport à la première.

On notera tout d'abord que le corps 10, qui présente le même contour que dans le cas des figures 1 à 8, présente ici une paroi d'épaisseur essentiellement constante sur toute sa périphérie.

Ce corps comporte, en lieu et place de l'orifice taraudé 18 de la première forme de réalisation, un orifice traversant lisse 19.

Par ailleurs une tige cylindrique 16 pourvue d'un filetage 16a s'étend dans l'axe de l'orifice 19 à partir de la région opposée du corps 10, située essentiellement à la transition entre ses parties de contour circulaire et de contour droit.

En outre, l'organe 20, qui présente sensiblement le même contour extérieur que dans le cas de la première forme de réalisation, est plein, mis à part un alésage central 28 débouchant au niveau de sa face postérieure et dans lequel est formé un taraudage 28a complémentaire du filetage 16a formé sur la tige saillante 16 du corps.

On observera ici que le pas d'hélice du filet 16a et du taraudage associé 28a est choisi sensiblement ou exactement égal au pas d'hélice du filet 22, qui reste présent à la surface extérieure de l'organe 20.

Autour du débouché de l'alésage 28 est prévue une partie tronconique 27.

On observera enfin que l'organe 20 possède sur sa

face antérieure un aménagement de vissage qui est dans ce cas constitué par une tête saillante 26 de section par exemple hexagonale.

L'implant selon cette seconde forme de réalisation s'utilise essentiellement de la même manière que celle précédemment expliquée.

La différence essentielle réside en ce que l'organe 20 est vissé sur la tige 16 à la manière d'un écrou, la taille de l'orifice 19 étant choisie de manière à ne pas faire obstacle à ce vissage. Il suffit à cet égard de choisir un diamètre d'orifice 19 légèrement supérieur au diamètre hors-tout du filet 22. On notera que la partie tronconique 27 de l'organe 20 permet de faciliter l'introduction de l'extrémité postérieure dudit organe dans l'orifice 19 préalablement au vissage.

Le pas du filet 16a étant le même que celui du filet 22, la progression de l'organe 20 dans le corps 10 à mesure que l'organe est entraîné en rotation est telle que le filet 22 vient ici encore mordre dans les plateaux vertébraux à la manière d'une vis auto-taraudeuse.

En particulier, on peut prévoir que les faces annulaires supérieure et inférieure 11 et 12 du corps 10 s'étendent dans des plans présentant une légère obliquité l'un par rapport à l'autre, de manière à s'adapter à la forme de l'espace intervertébral concerné. Ainsi l'on peut proposer au chirurgien, comme on le verra plus loin, des corps 10 présentant des obliquités différentes pour s'adapter à la morphologie des vertèbres à traiter.

Dans ce cas, la forme de réalisation des figures 9 à 15 est avantageuse en ce que l'on peut donner au contour extérieur de l'organe 20 une forme légèrement tronconique, de telle sorte que le degré de débordement

du filet 22 par rapport aux sommets des nervures 11a et 11b reste essentiellement constant de l'avant vers l'arrière de l'implant et que, les faces concernées des vertèbres étant sensiblement parallèles aux faces supérieure et inférieure du corps 10, l'ancrage par le filet soit essentiellement de même importance de l'extrémité proximale jusqu'à l'extrémité distale.

En référence maintenant aux figures 16 à 19, on a représenté un implant selon une troisième forme de réalisation de l'invention, qui comprend un corps 10 présentant en section horizontale la forme générale d'un « U », avec un fond 101 ou paroi distale et deux parois ou branches latérales essentiellement parallèles 102, 103. Ce corps comporte des faces supérieure et inférieure en forme de « U », respectivement 104, 104', sur lesquelles sont ménagées des dents d'ancrage osseux, respectivement 105, 105', en l'espèce des dents à bords vifs de profil triangulaire, qui remplissent un rôle analogue à celui des nervures 11b des formes de réalisation précédentes. On observe en particulier sur la figure 17 que les faces supérieure et inférieure 104, 104' vont en se rapprochant légèrement l'une de l'autre en direction de la région de fond 101.

Dans la paroi distale 101 est formé un alésage taraudé 1010 permettant la fixation temporaire d'un instrument, non représenté et classique en soi, pour la pose du corps dans l'espace intervertébral.

Les branches 102, 103 définissent un espace intérieur généralement cylindrique, à des fins expliquées plus loin.

Les deux branches latérales 102, 103 du corps comportent chacune une fente longitudinale traversante,

respectivement 106, 107, ces fentes étant destinées à autoriser une croissance osseuse latéralement.

A l'extrémité ouverte du corps 10, à l'opposé de son fond 101, est formée une ouverture généralement circulaire délimitée par un filet rentrant 108 prévu aux extrémités libres proximales des deux branches 102, 103.

L'implant comporte un organe de renforcement d'ancrage 20 pourvu d'une âme creuse dont la surface externe est légèrement tronconique, en se rétrécissant de son extrémité proximale vers son extrémité distale. A la surface extérieure de l'âme 21 est formé un filetage continu 22.

Ce filetage 22, en forme de bande plate conformée en hélice, est apte à coopérer avec le filet rentrant 108 du corps 10 pour permettre le vissage de l'organe 20 à l'intérieur dudit corps.

Comme on l'observe en particulier sur la figure 16, l'âme 21 est constituée par trois branches longitudinales angulairement décalées, séparées par des espaces vides longitudinaux 23.

Chacune de ces branches comporte un bord d'attaque (c'est-à-dire le bord avant dans la direction du vissage de l'organe 20) qui est tranchant en 21a, de manière à constituer un organe de raclage de la matière osseuse des vertèbres sus- et sous-jacente. De la sorte, le vissage de l'organe 20 va permettre de remplir l'espace intérieur de l'implant avec des copeaux osseux, ce qui va favoriser la prise de greffe et finalement la soudure par croissance osseuse entre les deux vertèbres.

On observera ici que le diamètre extérieur du filetage 22 est de préférence très voisin du diamètre intérieur du corps 10, de manière à assurer, lors du

vissage de l'organe 20, son guidage à l'intérieur du corps.

Enfin l'organe 20 comporte, dans sa partie proximale 24 formant une douille, une ouverture délimitée par une pluralité de bossages 24b séparés par des zones en creux 24c. Les bossages 24b, qui constituent l'amorce des branches 21 de l'âme, portent à leur surface intérieure un taraudage.

L'implant comporte enfin un bouchon généralement cylindrique 30 possédant à sa surface extérieure un filetage 31 apte à coopérer avec le taraudage défini par les bossages 24b. La face postérieure 32 de ce bouchon est munie d'une empreinte en creux 32a pour un outil de vissage.

L'implant tel que décrit ci-dessus s'utilise comme de la façon suivante :

- le corps 10, dépourvu de l'organe 20, est mis en place entre les vertèbres à traiter;

- l'organe 20, dépourvu de son bouchon 30, est rempli de greffons osseux par son ouverture postérieure, puis le bouchon est mis en place dans cette ouverture pour éviter que les greffons ne s'échappent;

- l'organe 20 muni de son bouchon est ensuite vissé dans le corps 10 déjà en place, à l'aide d'un outil de vissage engagé dans l'empreinte 32a; au cours de cette opération, le filetage 22 de l'organe 20 vient s'ancrer dans les surfaces en vis-à-vis des vertèbres sus- et sous-jacentes, avec le cas échéant détachement de copeaux osseux; en outre, les bords tranchants 21a des trois branches 21 de l'âme de l'organe 20 attaquent les vertèbres pour détacher des copeaux qui vont compléter le remplissage de l'espace intérieur de l'organe 20; enfin

la forme tronconique de l'âme 21 de l'organe 20 assure, à mesure de son avancée, une compression d'une partie de cette matière osseuse contre les parois des vertèbres, pour favoriser la greffe.

Les figures 20 à 23 illustrent une quatrième forme de réalisation de l'invention, dans laquelle le corps 10 est similaire à celui des figures 16 à 19, et ne sera pas à nouveau décrit dans son ensemble. On observera toutefois que, dans cet exemple, seule la branche 102 du corps est pourvue d'une fente traversante 106, tandis que l'autre branche en est dépourvue. Ce type de corps est utilisé avantageusement lorsque l'on utilise deux implants selon l'invention dans un même espace intervertébral. Dans ce cas, les implants sont disposés côte-à-côte de telle sorte que les fentes respectives des deux corps se trouvent du côté interne, ceci afin de favoriser la fusion avec des greffons osseux placés dans la région de l'espace intervertébral située entre les deux implants.

L'organe de renforcement d'ancrage 20 présente dans ce cas la forme d'un bouchon fileté sensiblement plus court que le corps 10 en direction axiale. Cet organe possède une âme pleine cylindrique 21 pourvue d'un filetage 22 apte à coopérer avec le filet 108 du corps 10, de la même manière que précédemment.

La face postérieure de l'organe 20 possède une empreinte en creux 24a pour outil de vissage, tandis que sa face antérieure 25 présente la forme d'un cône à sommet arrondi.

L'implant selon cette forme de réalisation est destiné à être utilisé en remplissant le corps 10 de greffons osseux de façon relativement dense. De la sorte,

la pénétration de l'organe 20 au cours du vissage assure, outre le renforcement d'ancrage réalisé à l'aide du filetage 22, une compression des greffons osseux situés dans le corps 10, pour les solliciter en particulier en direction des plateaux vertébraux sus- et sous-jacents et améliorer la fusion.

Les figures 24 à 27 illustrent une cinquième forme de réalisation de l'invention. Le corps 10 de l'implant se distingue de celui des troisième et quatrième formes de réalisation essentiellement par le fait que la partie de fond 101 possède une ouverture cylindrique traversante 101a disposée selon l'axe du corps, et que l'ouverture d'entrée située à l'opposé du fond 101 est dépourvue du filet 108 des réalisations précédentes.

L'organe de renforcement d'ancrage 20 présente ici la forme d'une vis à filet large, qui possède à son extrémité antérieure un prolongement en forme d'arbre formé de deux pattes essentiellement semi-cylindriques axiales 29a, 29b présentant à leur extrémité libre une surépaisseur, respectivement 291a, 291b.

Ces deux pattes présentent un diamètre extérieur légèrement inférieur au diamètre de l'ouverture 101a du corps 10, et une épaisseur réduite de manière à ce que leur déformabilité élastique permette, préalablement à la pose par le chirurgien, l'encliquetage de l'organe 20 dans le corps 10, ledit organe 20 étant ainsi bloqué contre toute translation mais étant libre en rotation et guidé d'une part par l'ouverture 101a, et d'autre part par les faces internes des deux branches 102, 103 du corps 10.

Une autre particularité essentielle de cette forme de réalisation réside en ce que l'organe 20 est délimité

par deux pans coupés ou plats, respectivement 201, 201', qui confèrent à l'organe, dans sa position angulaire telle qu'illustrée sur la figure 24, une épaisseur sensiblement égale à l'épaisseur du corps 10, et ceci tout le long de celui-ci.

On observe également qu'à la transition entre le filetage 22 (de section carrée) et les pans coupés 201, 201', les filets forment chacun un angle vif 22a.

Par ailleurs, comme dans certaines des formes de réalisation précédentes, la partie proximale 24 de l'organe 20 est munie d'une empreinte en creux 24a pour un outil de vissage.

La pose de l'implant par le chirurgien s'effectue comme suit :

- l'implant complet, c'est-à-dire le corps 10 abritant l'organe 20 préalablement encliqueté et auquel on a donné l'orientation angulaire de la figure 24, est engagé par impaction dans l'espace intervertébral, cette opération étant facilitée par le fait que l'organe 20 ne déborde pas par rapport aux limites du corps 10;

- l'organe 20 est ensuite tourné sur lui même à l'aide d'un outil approprié engagé dans l'empreinte 24a, si bien que les bords vifs des filets 22 viennent attaquer la matière osseuse des plateaux vertébraux sus- et sous-jacents, en arrachant de ce fait des copeaux osseux qui vont remplir les espaces libres existant entre le corps 10 et l'organe 20 pour contribuer à la fusion.

Du fait que l'organe 20 est bloqué contre toute translation par rapport au corps 10, et n'a donc pas vocation à être vissé dans celui-ci ou dans les plateaux vertébraux, on donne avantageusement aux filets 22 un pas d'hélice important, de telle sorte que l'action de

vissage privilégie un glissement réciproque des filets 22 par rapport aux plateaux vertébraux, sans induire d'effort axial suffisamment important pour déplacer l'implant selon cette direction.

Maintenant en référence aux figures 28 à 32, on va décrire une première variante d'exécution de la troisième forme de réalisation de l'invention décrite plus haut en référence aux figures 16 à 19. Dans la description qui suit, on ne reprendra pas les éléments déjà décrits en référence aux figures 16 à 19, mais seulement les différences essentielles apportées par la variante.

Selon cette variante, le corps 1 est élargi et conçu pour recevoir deux organes de renforcement d'ancrage, respectivement 20a et 20b. A cet effet, le corps 10 est élargi et possède deux branches latérales 102 et 103 ainsi qu'une branche intermédiaire médiane 109 s'étendant entre les branches 102 et 103.

Les branches 102 et 109 définissent un premier logement pour l'organe 20a, tandis que les branches 103 et 109 définissent un second logement pour l'organe 20b, les axes de ces deux logements étant ici mutuellement parallèles mais pouvant le cas échéant adopter une certaine obliquité. Ces deux logements possèdent de préférence la même configuration que le logement unique de la troisième forme de réalisation, et les organes 20a et 20b sont de préférence semblables à l'organe 20 de cette même forme de réalisation.

De même, le corps 10 est pourvu de dents d'ancrage osseux 105, 105'.

On observera ici, comme le montrent tout particulièrement les figures 30 et 31, que les faces supérieure et inférieure 104 et 104' du corps 10

présentent une double obliquité, l'une correspondant à un rapprochement de ces faces en direction du fond des logements, et l'autre correspondant à un rapprochement de ces faces dans une direction latéral (de la droite vers la gauche sur la figure 30, mais le rapprochement inverse pouvant être réalisé en retournant simplement le corps 10 sur lui-même.

Cette double obliquité permet au corps 10 d'être implanté en biais en tout en rétablissant la lordose lombaire dans le plan sagittal.

Par ailleurs, la largeur accrue de l'implant permet d'assurer un appui plus stable entre les deux plateaux vertébraux, tandis que la présence de deux organes de renforcement d'ancrage 20a et 20b permet de renforcer la résistance au glissement par rapport à ces plateaux.

Bien entendu, cette variante de réalisation de l'invention peut s'appliquer à tous les autres implants décrits dans le présent mémoire, seule une adaptation du corps 10, à la portée de l'homme du métier, étant nécessaire.

En référence maintenant aux figures 33 à 44, on va décrire une autre variante de réalisation de l'implant décrit en référence aux figures 16 à 19.

Selon cette variante, le corps extérieur 10 de l'implant comprend, de la même manière que précédemment, une forme générale de « U » avec deux branches latérales 102 et 103 réunies par une paroi d'extrémité distale 101, avec des transitions arrondies.

Pour accroître la largeur de l'implant, et donc améliorer sa stabilité, on prévoit que les branches latérales 102 et 103 présentent en direction latérale une épaisseur sensiblement supérieure à celle des branches

102 et 103 décrites en référence aux figures 16 à 19.

De préférence, cette épaisseur est choisie de manière à donner à la largeur hors-tout de l'implant une valeur par exemple égale à environ 1,5 à 2,5 fois le diamètre de l'organe de renforcement d'ancrage 20.

En outre, pour améliorer encore la fusion osseuse entre les plateaux vertébraux sus- et sous-jacents, on prévoit des ouvertures traversantes oblongues 110 et 111 s'étendant par exemple verticalement entre la face supérieure 104 et la face inférieure 104' du corps, de telle sorte que les branches latérales 102 et 103 possèdent chacune une double paroi. Dans chacune des ces parois est par ailleurs ménagée une ouverture oblongue généralement horizontale, respectivement 106, 106' et 107, 107' qui permettent à l'espace intérieur du corps 10 de s'ouvrir latéralement sur l'extérieur du corps, en traversant les deux doubles parois et les ouvertures traversantes 110, 111 respectivement..

On observe par ailleurs, comme le montrent les figures 43 et 44, que les faces supérieure et inférieure 104 et 104' du corps présentent l'une par rapport à l'autre une double obliquité, d'une part en direction latérale, et d'autre part de l'extrémité proximale vers l'extrémité distale.

L'organe de renforcement d'ancrage 20 présente une construction semblable à celle qui a été décrite en référence aux figures 16 à 19. Il comprend pour l'essentiel une fourche intérieure possédant deux branches 21, desquels est solidaire une bande hélicoïdale 22 formant un filet d'ancrage osseux, les parties 21 et 22 étant de préférence réalisées d'un seul tenant.

Le filet 22 est de préférence ici un filet auto-

taraudeur, permettant de réaliser un vissage en attaquant directement les plateaux vertébraux sus- et sous-jacents, sans avoir à réaliser préalablement à la pose un taraudage dans ces plateaux vertébraux. A cet effet, le filet 22 présente dans sa région d'extrémité distale une section radiale 22b en forme de pointe tournée vers l'extérieure, et cette section varie progressivement, par exemple sur l'étendue d'une fraction de tour, jusqu'à une section radiale rectangulaire 22c. En outre, le diamètre du filet 22 augmente progressivement de son extrémité distale jusqu'à ladite partie de section rectangulaire qui est ici de diamètre constant.

On observe également que les faces extérieures des branches 21 présentent une forme tronconique, dont le diamètre diminue de l'extrémité proximale vers l'extrémité distale, à des fins expliquées plus loin.

Les deux branches sont réunies au niveau d'une douille 24 qui présente la forme d'une bague cylindrique réalisée de préférence d'un seul tenant avec lesdites branches.

Dans cette douille 24 peut être monté par encliquetage élastique à partir de l'extérieur un bouchon 30 qui possède une série de pattes flexibles de verrouillage 33, en l'espèce deux paires de pattes, s'engageant dans l'ouverture centrale de la douille 24 et dont les extrémités en forme de dents 33a peuvent venir s'accrocher sur le bord interne de la douille 24.

L'organe 20 et son bouchon 30 sont solidarisés ensemble vis-à-vis de la rotation par le fait que chaque paire de pattes 33 vient entourer étroitement l'amorce d'une branche respective 21 de la fourche.

Le bouchon 30 possède également un alésage taraudé

34 disposé centralement et permettant de recevoir l'extrémité en forme de tige filetée d'un instrument, connu en soi et non représenté, de pose de l'organe 20.

On observe par ailleurs sur les figures 40 et 44 que deux encoches diamétralement opposées 35, ménagées de part et d'autre de l'alésage taraudé 34, permettent de réaliser une indexation angulaire de l'instrument précité, alors équipé d'aménagements complémentaires, par rapport au bouchon 30 et donc à l'ensemble de l'organe 20 de renforcement d'ancrage.

On observe ensuite, en particulier sur la figure 44, que le filet 108 permettant d'assurer une coopération vissée entre le corps extérieur 10 et l'organe 20 est prévu seulement sur l'une des branches latérales 102 du corps, sous la forme d'une membrure rentrante se terminant par un bord 108a généralement rectiligne.

Enfin l'on observe, en particulier sur les figures 33, 38 et 40, que l'extrémité du filet 22 côté proximal est déformée, comme indiqué en 22d, cette déformation étant réalisée en direction du tour de filet adjacent, c'est-à-dire vers l'extrémité distale.

Cette déformation permet de conférer au filet 22 une fonction de blocage contre la rotation inverse, et donc d'éviter que l'organe de renforcement d'ancrage 20, après la pose mais avant la fusion osseuse, ne risque de se désolidariser du corps 10.

La pose de l'implant décrit ci-dessus en référence aux figures 33 à 44 s'effectue avec les étapes successives suivantes :

- tout d'abord, on remplit les ouvertures 110 et 111 du corps 10 de matière promotrice de croissance osseuse, telle que des greffons osseux ;

- après distraction si nécessaire, on insère ensuite le corps dans l'espèce intervertébral ;

- on remplit l'organe 20 de renforcement d'ancrage avee une matière promotrice de croissance osseuse, puis on ferme cet organe 20 à son extrémité proximale par encliquetage du bouchon 30 ;

- par vissage, on engage ledit organe dans le corps préalablement posé ; il est à noter ici que la forme tronconique des deux branches 21 de la fourche de l'organe 20 permet, à mesure de l'avancée de l'organe 20, de comprimer la matière de croissance osseuse et donc d'assurer un bon contact d'une part avec les plateaux vertébraux sus- et sous-jacents, et d'autre part avec la matière de croissance osseuse préalablement placée dans les ouvertures 110 et 111, via les ouvertures 108 et 109.

Les implants selon l'invention sont bien évidemment réalisés en un matériau biocompatible de rigidité appropriée, tel qu'un alliage de titane ou un acier inoxydable.

De façon avantageuse, on propose au chirurgien des implants selon l'invention sous la forme d'un jeu d'implants de formes et de dimensions différentes, qui permettent de choisir l'implant, et en particulier le corps 10, le mieux adapté à la morphologie du site de pose.

En particulier, on peut prévoir des implants :

- dont les corps 10 présentent des hauteurs différentes, avec dans ce cas des organes de renforcement d'ancrage 20 dont les diamètres peuvent évoluer pour s'adapter à ces différentes hauteurs,

- dont les corps présentent des largeurs différentes ; ainsi l'on peut prévoir, dans le cas

particulier de la troisième forme de réalisation, une gamme d'implants dont les largeurs varient progressivement entre une largeur minimale (cas des figures 16 à 19) et une largeur maximale (par exemple telle que représentée sur les figures 33 à 44), en faisant varier l'épaisseur en direction latérale des branches latérales 102 et 103 du corps, tout en conservant la même taille d'espace intérieur et donc tout en pouvant utiliser le même organe 20 dans tous les cas ; avantageusement, ces branches latérales 102, 103 passent d'une simple paroi (figures 16 à 19) à une double paroi (figures 33 à 44) dès que l'épaisseur desdites branches 102, 103 est devenue suffisante pour permettre de pratiquer les ouvertures traversantes verticales 110 et 111 ;

- dont les corps présentent des faces supérieures et inférieures d'inclinaisons mutuelles différentes, aussi bien de l'avant vers l'arrière que latéralement, avec des organes 20 de diamètres identiques ou différents ;

- dont les corps 10 et/ou les organes de renforcement d'ancrage 20 présentent des longueurs différentes ;

- dont les organes de renforcement d'ancrage présentent des saillies d'ancrage différentes, et en particulier plus ou moins profondes et plus ou moins espacées, selon les caractéristiques mécaniques rencontrées au niveau des plateaux vertébraux ; etc.

Bien entendu, la présente invention n'est nullement limitée aux formes de réalisation décrites ci-dessus et illustrées sur les dessins, mais l'homme du métier saura y apporter toute variante ou modification conforme à son esprit, et en particulier combiner entre elles les

particularités des diverses formes de réalisation décrites.

Par ailleurs, les saillies d'ancrage osseux telles que décrites plus haut peuvent être constituées par tout moyen permettant d'assurer un ancrage mécanique et/ou par liaison osseuse avec les plateaux vertébraux sus- et sous-jacents. En particulier, il peut s'agir de revêtement poreux ou d'hydroxyapatite.

REVENDICATIONS

1. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps creux possédant des surfaces supérieure et inférieure pourvues de dents à bords vifs aptes à être ancrées dans lesdites vertèbres afin de s'opposer au mouvement inverse dudit corps hors dudit espace intervertébral.

2. Implant selon la revendication 1, dans lequel lesdites dents présentent une section transversale triangulaire.

3. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans

un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites parois latérales du corps creux sont partiellement cylindriques et coaxiales avec un axe dudit organe de renforcement d'ancrage.

4. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites parois latérales possèdent des ouvertures traversantes autorisant une croissance osseuse à travers elles.

5. Implant selon la revendication 4, dans lequel lesdites ouvertures comprennent des fentes allongées s'étendant essentiellement parallèlement à la direction d'insertion dudit organe dans ledit corps creux.

6. Implant selon la revendication 4, dans lequel les parois latérales du corps sont des parois épaisses dans lesquelles sont formées des secondes ouvertures traversantes s'étendant entre les faces supérieure et inférieure du corps.

7. Implant selon la revendication 6, dans lequel lesdites premières ouvertures traversantes mettent en communication ledit espace intérieur avec lesdites secondes ouvertures traversantes.

8. Implant selon la revendication 6, dans lequel il est prévu des ouvertures traversantes mettant en communication lesdites secondes ouvertures traversantes avec les côtés extérieurs du corps.

9. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps creux possède une paroi d'extrémité distale reliant lesdites parois latérales, ladite paroi d'extrémité distale étant arrondie pour faciliter l'insertion dudit corps creux dans ledit espace intervertébral.

10. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un

espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps creux possède une paroi d'extrémité distale reliant lesdites parois latérales, ladite paroi d'extrémité distale possédant un trou taraudé pour la fixation temporaire dudit corps creux à un instrument d'insertion du corps.

11. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis autotaraudeur.

12. Implant selon la revendication 11, dans lequel ledit filetage de vis présente une section radiale généralement quadrangulaire.

13. Implant selon la revendication 12, dans lequel ledit filetage de vis présente une section radiale qui passe progressivement d'une section radiale essentiellement triangulaire à ladite section radiale généralement quadrangulaire à partir de l'extrémité distale dudit filetage.

14. Implant selon la revendication 11, dans lequel le diamètre du filetage de vis augmente progressivement à partir de son extrémité distale jusqu'à une partie de diamètre essentiellement constant.

15. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis sous la forme d'une bande en hélice encerclant un espace intérieur dudit organe de renforcement d'ancrage.

16. Implant selon la revendication 15, dans lequel ladite bande en hélice est reliée à une fourche

s'étendant à l'intérieur de ladite bande dans une direction axiale dudit organe.

17. Implant selon la revendication 16, dans lequel ladite fourche comprend deux branches s'étendant à partir d'une paroi d'extrémité proximale dudit organe de renforcement d'ancrage.

18. Implant selon la revendication 16, dans lequel ladite fourche comprend des branches présentant une surface extérieure en forme de partie de tronc de cône dont le diamètre diminue de l'extrémité proximale vers l'extrémité distale de l'organe.

19. Implant selon la revendication 16, dans lequel ladite fourche comprend au moins deux branches possédant chacune un bord tranchant d'attaque de l'os.

20. Implant selon la revendication 16, dans lequel la fourche et la bande en hélice sont réalisées d'un seul tenant.

21. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps,

ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis, et dans lequel ledit organe possède des moyens de blocage de celui-ci contre une rotation inverse.

22. Implant selon la revendication 21, dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis et lesdits moyens de blocage comprennent une partie déformée dudit filetage dans la région de son extrémité proximale.

23. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis possédant un diamètre extérieur qui diminue dans sa région distale vers son extrémité distale.

24. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un

espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit organe de renforcement d'ancrage possède une paroi d'extrémité proximale apte à essentiellement fermer une ouverture frontale dudit corps creux, de telle sorte qu'une substance promotrice de croissance osseuse placée à l'intérieur dudit organe soit comprimée pendant l'insertion dudit organe dans ledit corps creux.

25. Implant selon la revendication 24, dans lequel ledit organe de renforcement d'ancrage possède au moins une partie dont la surface externe appartient à un tronc de cône.

26. Implant selon la revendication 24, dans lequel ledit organe de renforcement d'ancrage est sensiblement plus court que le corps et possède une pointe généralement conique dirigée vers ladite paroi d'extrémité distale du corps.

27. Implant selon la revendication 24, dans lequel ladite paroi d'extrémité proximale possède une ouverture taraudée pour la fixation temporaire dudit organe à un instrument d'insertion de l'organe.

28. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit organe de renforcement d'ancrage possède des moyens d'indexation pour fixer ledit organe à un instrument d'insertion de l'organe dans une relation angulaire donnée.

29. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage creux possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit organe de renforcement d'ancrage possède à son extrémité proximale un bouchon rapporté.

30. Implant selon la revendication 29, dans lequel ledit bouchon est vissé dans une ouverture frontale taraudée de l'organe de renforcement d'ancrage.

31. Implant selon la revendication 29, dans lequel ledit bouchon est engagé par encliquetage élastique dans une ouverture frontale de l'organe de renforcement d'ancrage.

32. Implant selon la revendication 29, dans lequel ledit bouchon possède un aménagement apte à coopérer avec un instrument permettant d'entraîner l'organe en rotation.

33. Implant selon la revendication 29, dans lequel ledit bouchon possède des aménagement d'indexation angulaire de l'organe de renforcement d'ancrage avec un instrument de pose dudit organe.

34. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis,

et au moins l'une des branches latérales du corps possède une partie rentrante formant filet apte à coopérer avec ledit filetage.

35. Implant selon la revendication 34, dans lequel ladite partie rentrante est prévue seulement sur l'une des branches et constitue la seule partie du corps coopérant par vissage avec le filetage de vis.

36. Implant selon la revendication 35, dans lequel ladite partie rentrante présente un bord d'extrémité libre essentiellement rectiligne.

37. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit organe est orienté en oblique par rapport à un plan du corps correspondant au plan sagittal.

38. Implant selon la revendication 21, dans lequel l'organe de renforcement d'ancrage est orienté à approximativement 45° par rapport à un plan du corps correspondant au plan sagittal.

39. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage creux possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel des ouvertures traversantes sont prévues dans ledit organe entre l'intérieur et l'extérieur de celui-ci, lesdites ouvertures étant allongées dans une direction essentiellement circonférentielle de l'organe.

40. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps possède une paroi d'extrémité distale, et ledit organe de renforcement d'ancrage possède une partie d'extrémité

distale apte à être vissée dans une ouverture de ladite paroi d'extrémité distale.

41. Implant selon la revendication 40, dans lequel ledit corps possède également une paroi d'extrémité proximale incluant une ouverture plus large que la dimension extérieure dudit organe de renforcement d'ancrage et dans laquelle ledit organe peut être engagé librement.

42. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel le corps présente une paroi proximale, une paroi distale et deux parois latérales, lesdites parois définissant entre elles un espace intérieur plus grand que ledit organe de renforcement d'ancrage.

43. Implant selon la revendication 42, dans lequel ledit organe de renforcement d'ancrage possède une partie filetée pour son vissage dans la paroi proximale du corps.

44. Implant selon la revendication 42, dans lequel ledit organe de renforcement d'ancrage et la paroi distale du corps possèdent des moyens filetés coopérant mutuellement pour la fixation dudit organe au corps.

45. Implant selon l'une des revendications 43 et 44, dans lequel lesdites saillies d'ancrage osseux comprennent un filetage de vis ayant le même pas que ladite partie filetée de fixation au corps.

46. Implant selon la revendication 42, dans lequel les parois latérales et la paroi proximale du corps s'étendent essentiellement sur un même arc de cercle, et ladite paroi distale est essentiellement rectiligne.

47. Implant selon la revendication 42, dans lequel les faces supérieure et inférieure du corps possèdent des saillies d'ancrage osseux s'étendant le long de ses parois.

48. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans

l'espace intérieur du corps, et dans lequel des moyens sont prévus pour le montage à rotation de l'organe de renforcement d'ancrage dans l'espace intérieur du corps tout en empêchant un mouvement de translation relative entre ceux-ci.

49. Implant selon la revendication 48, dans lequel les moyens de montage comprennent une ouverture cylindrique formée dans une paroi d'extrémité distale dudit corps et un arbre prévu sur ledit organe et apte à être engagé par déformation élastique dans ladite ouverture.

50. Implant selon la revendication 48, dans lequel ledit organe de renforcement d'ancrage présente la forme d'une vis possédant deux plats diamétralement opposés, lesdites saillies d'ancrage osseux étant définies entre lesdits plats et des bords tranchants étant prévus aux transitions entre le filetage de la vis et les plats.

51. Implant selon la revendication 50, dans lequel la distance entre les plats opposés n'est pas supérieure à la distance entre les faces supérieure et inférieure dudit corps.

52. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant un ensemble de parois généralement parallèles définissant au moins deux espaces intérieurs situés côte-à-côte et exposés aux vertèbres sus- et sous-jacente qui

définissent ledit espace intervertébral, ledit implant comprenant en outre au moins deux organes de renforcement d'ancrage possédant sur leur surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, lesdits organes étant aptes à être entraînés en rotation dans des espaces intérieurs respectifs dudit corps.

53. Implant selon la revendication 52, dans lequel lesdits organes sont identiques.

54. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps creux possède des surfaces supérieure et inférieure qui sont inclinées l'une par rapport à l'autre, avec une distance entre elles qui diminue de l'extrémité proximale vers l'extrémité distale du corps.

55. Un implant pour la chirurgie du rachis, comprenant un corps essentiellement creux apte à être inséré dans un espace intervertébral, ledit corps possédant une paire de parois latérales entourant un

espace intérieur exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, ledit implant comprenant en outre un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur du corps, et dans lequel ledit corps creux possède des surfaces supérieure et inférieure qui sont inclinées l'une par rapport à l'autre, avec une distance entre elles qui diminue d'un premier côté latéral du corps vers le côté latéral opposé.

56. Un jeu d'implants pour former un implant rachidien destiné à être inséré dans un espace intervertébral de la colonne vertébrale humaine en étant adapté à la géométrie dudit espace intervertébral, ledit jeu comprenant :

une pluralité de corps creux possédant chacun une paire de parois latérales délimitant un espace intérieur et aptes chacun à être inséré dans un espace intervertébral de telle manière que ledit espace intérieur soit exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral, chacun desdits corps ayant une taille et une forme spécifiques,

au moins un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout des corps, ledit organe étant apte à être entraîné en rotation dans l'espace intérieur de l'un quelconque desdits corps,

de telle sorte qu'un corps creux spécifique convenant à la configuration particulière d'un espace intervertébral donné puisse être choisi parmi ladite pluralité de corps creux.

57. Jeu d'implants selon la revendication 56, dans lequel ladite pluralité de corps creux inclut un groupe de corps creux possédant différents angles d'inclinaison entre leurs surfaces supérieures et inférieures.

58. Jeu d'implants selon la revendication 56, dans lequel ladite pluralité de corps creux inclut un groupe de corps creux présentant différentes largeurs.

59. Jeu d'implants selon la revendication 58, dans lequel les corps creux les plus larges présentent des parois latérales dans lesquelles sont formées des ouvertures traversantes s'étendant entre les faces supérieures et inférieures desdits corps.

60. Jeu d'implants selon la revendication 56, dans lequel ladite pluralité de corps creux inclut un groupe de corps creux présentant différentes hauteurs.

61. Jeu d'implants selon la revendication 56, dans lequel ladite pluralité de corps creux inclut un groupe de corps creux présentant différentes longueurs.

62. Jeu d'implants selon la revendication 56, dans lequel un groupe déterminé de corps creux de ladite

pluralité est apte à recevoir un même type d'organe de renforcement d'ancrage.

63. Procédé pour positionner dans un espace intervertébral d'une colonne vertébrale humaine un implant comprenant un corps essentiellement creux possédant une paire de parois latérales entourant un espace intérieur et un organe de renforcement d'ancrage possédant sur sa surface extérieure des saillies d'ancrage osseux inscrites dans un diamètre supérieur à la hauteur hors-tout du corps et apte à être entraîné en rotation dans l'espace intérieur du corps, ledit procédé comprenant les étapes suivantes :

sélectionner à partir d'un jeu de corps creux possédant différentes formes et dimensions un corps creux adapté à la configuration dudit espace intervertébral ;

remplir ledit corps creux sélectionné avec une substance promotrice de croissance osseuse ;

pousser ledit corps creux dans ledit espace intervertébral de telle manière que l'espace intérieur de celui-ci soit exposé aux vertèbres sus- et sous-jacente qui définissent ledit espace intervertébral ; et

insérer ledit organe de renforcement d'ancrage dans ledit corps creux de telle manière que lesdites saillies d'ancrage osseux s'ancrent dans lesdites vertèbres sus- et sous-jacente.

64. Procédé selon la revendication 63, pour le positionnement d'un implant dont le corps présente des parois latérales pourvues d'ouvertures traversantes s'étendant entre les faces supérieure et inférieure dudit corps, comprenant en outre, avant l'étape de poussée

dudit corps creux dans ledit espacé intervertébral, une étape de remplissage desdites ouvertures traversantes avec une substance promotrice de croissance osseuse.

FIG.1

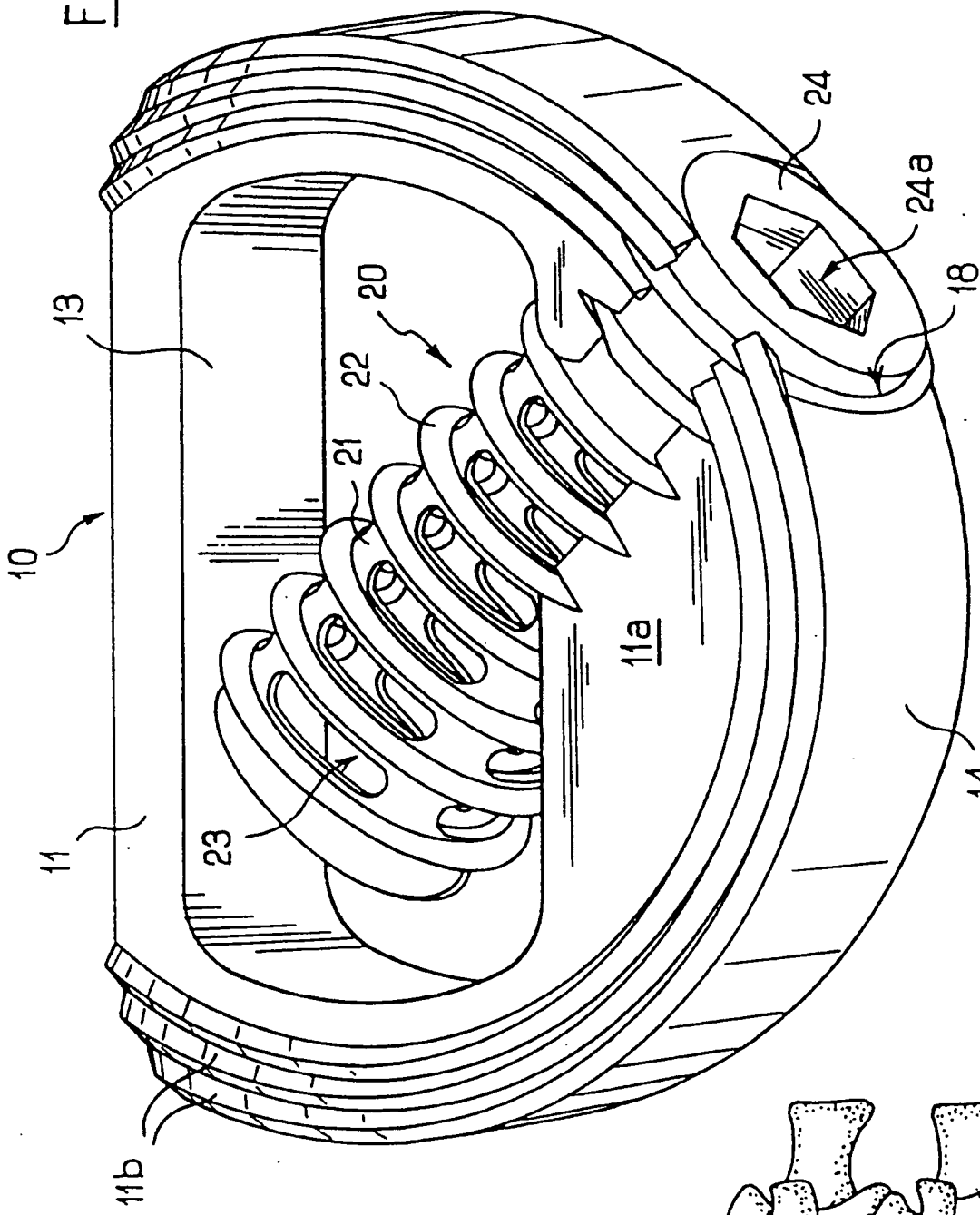
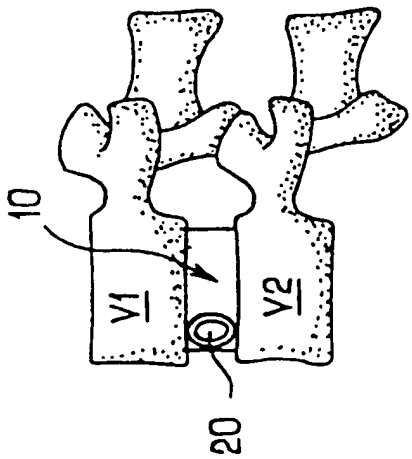
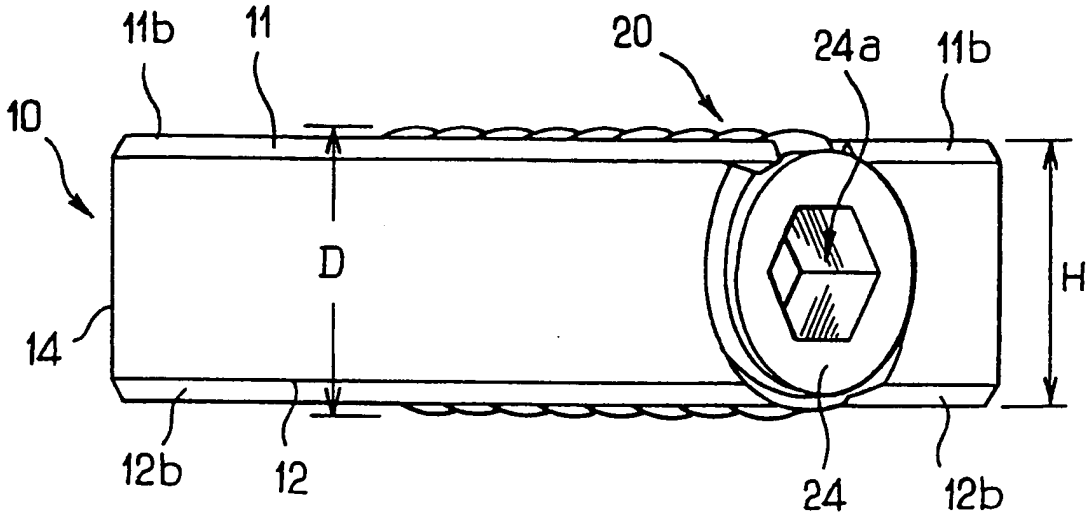


FIG.2

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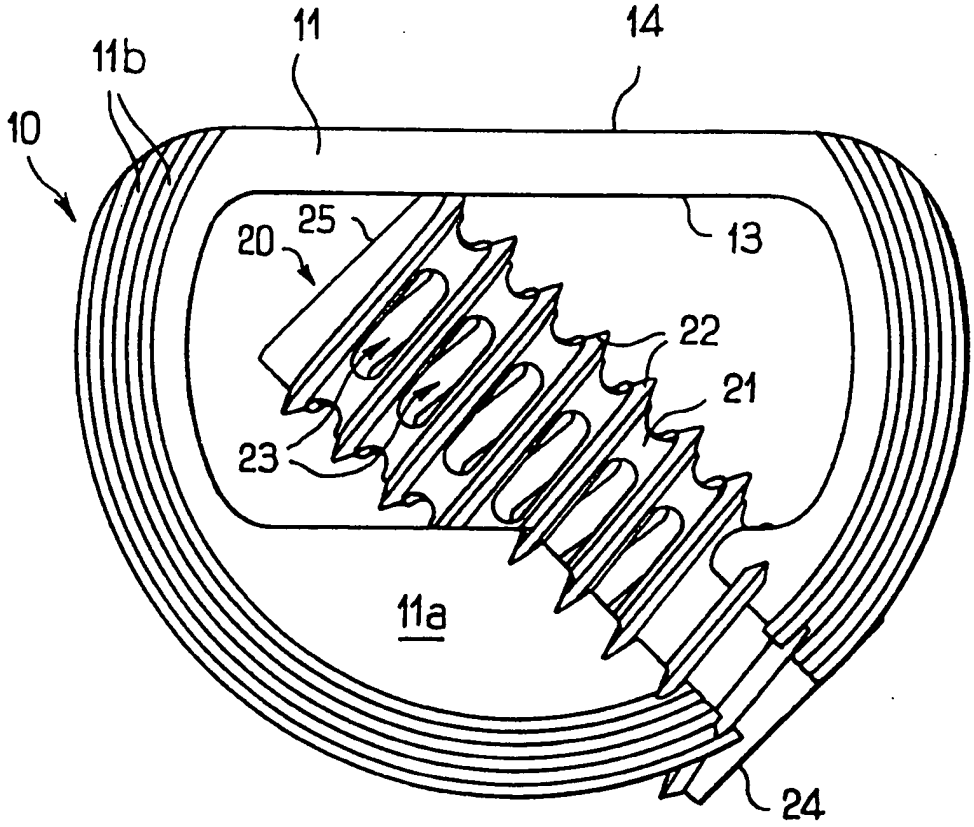
24
12b

FIG_3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11a
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FIG_4

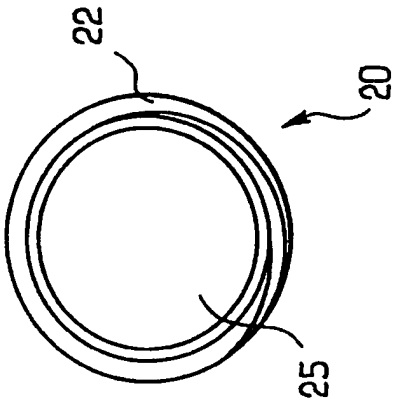


FIG.6

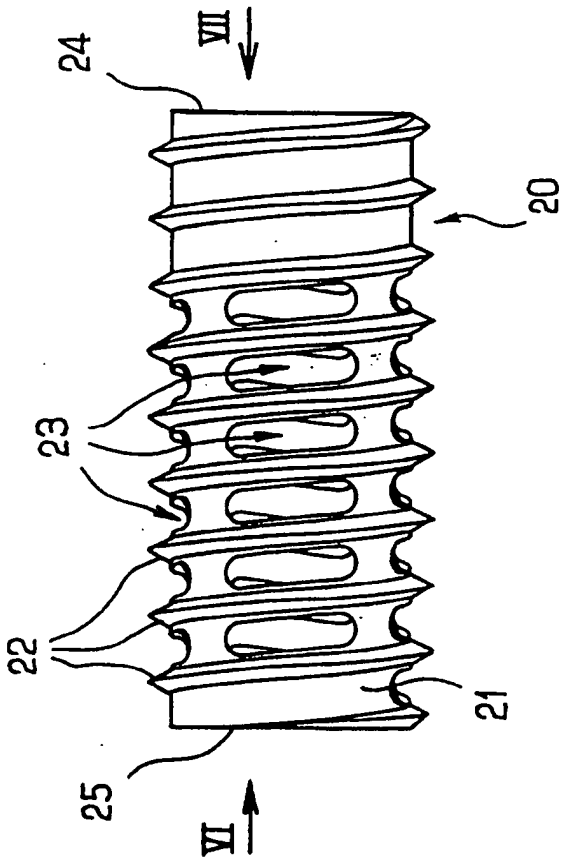


FIG.5

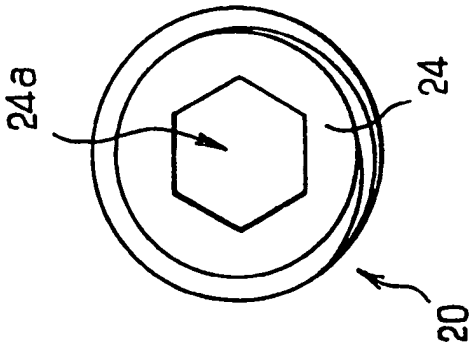


FIG.7

FIG.8

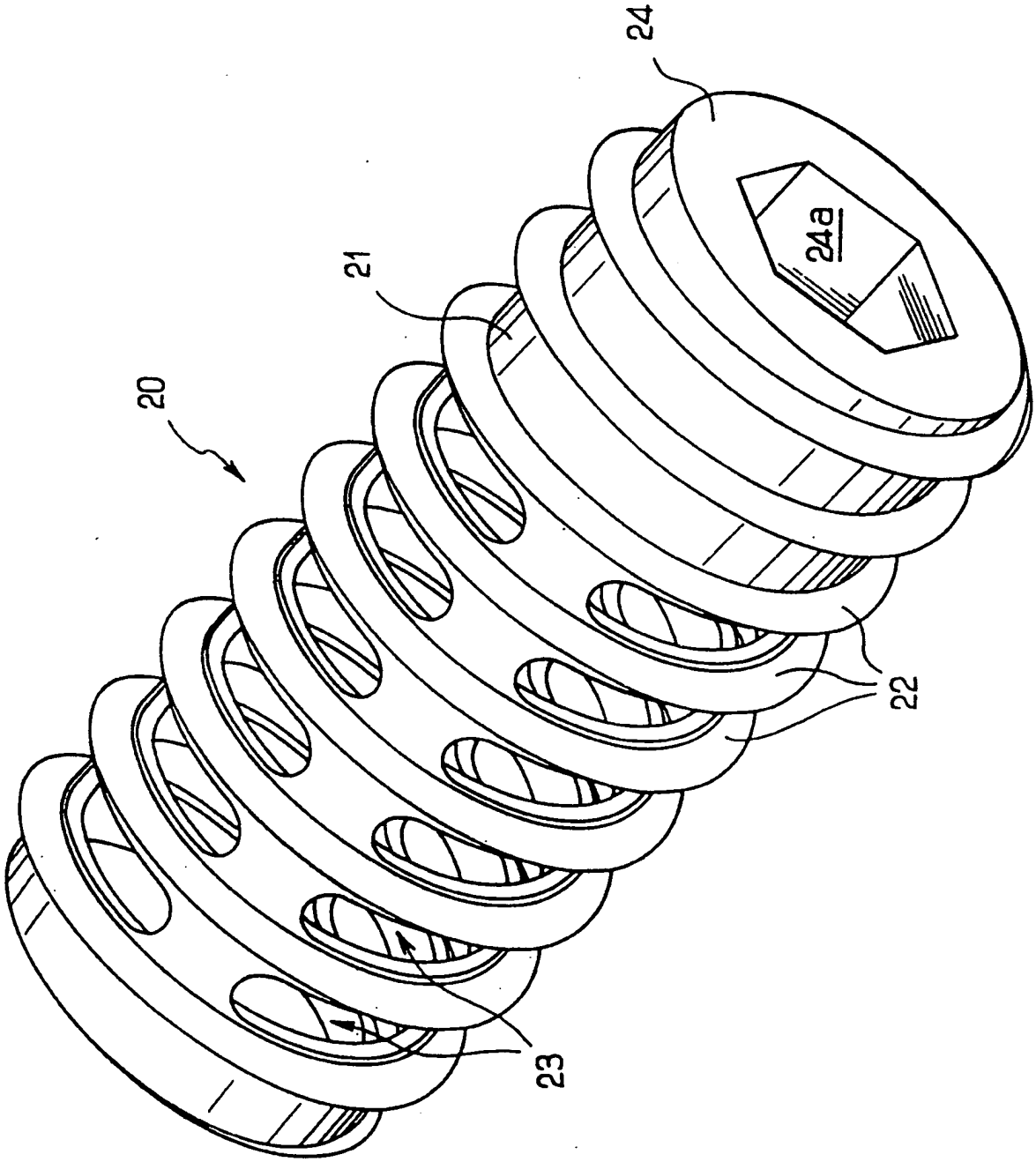
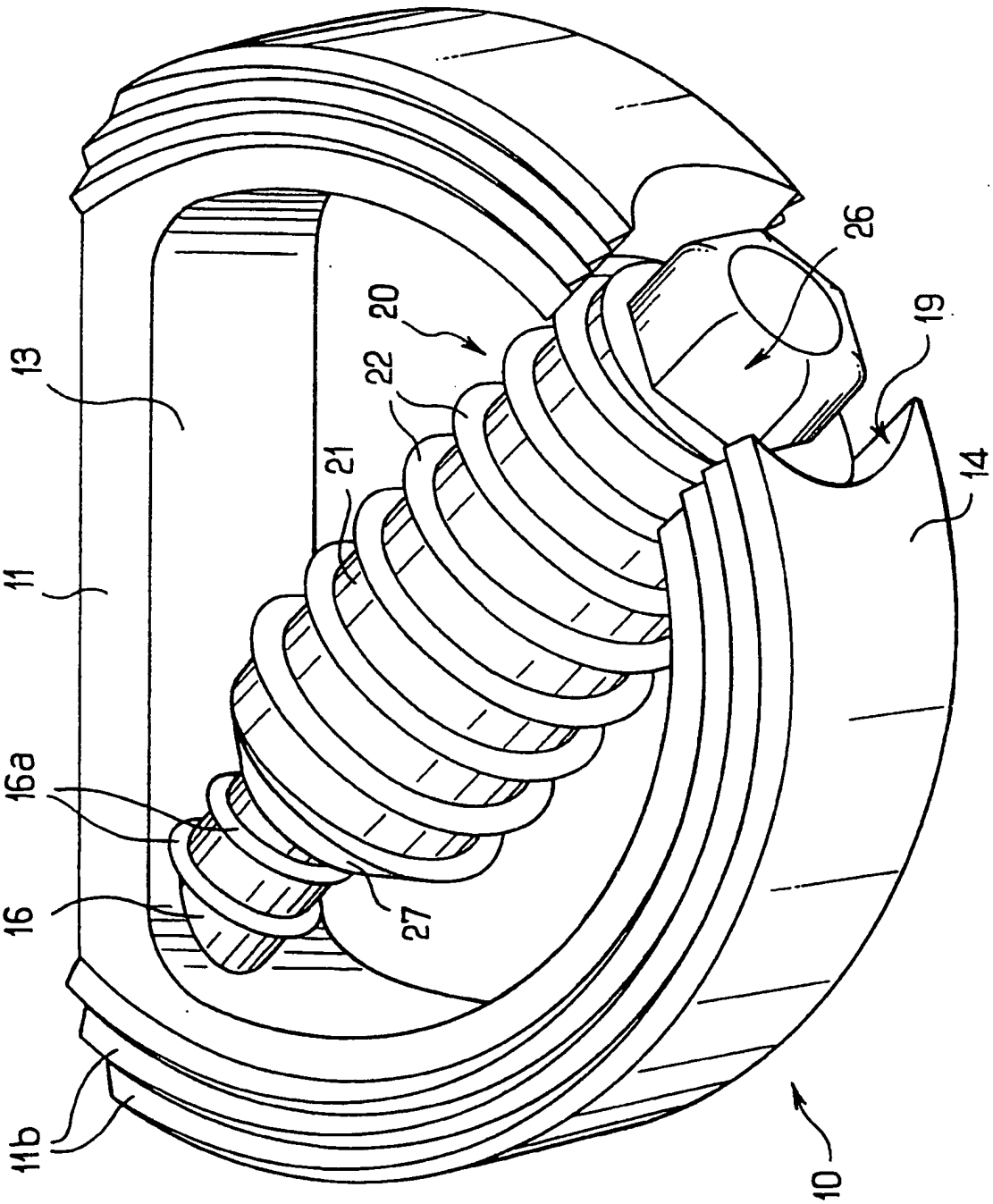
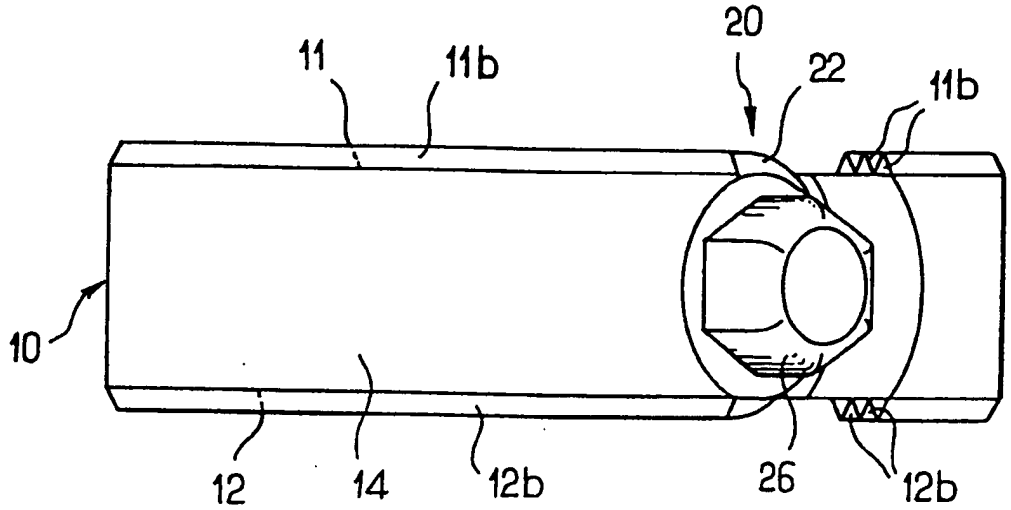


FIG_9

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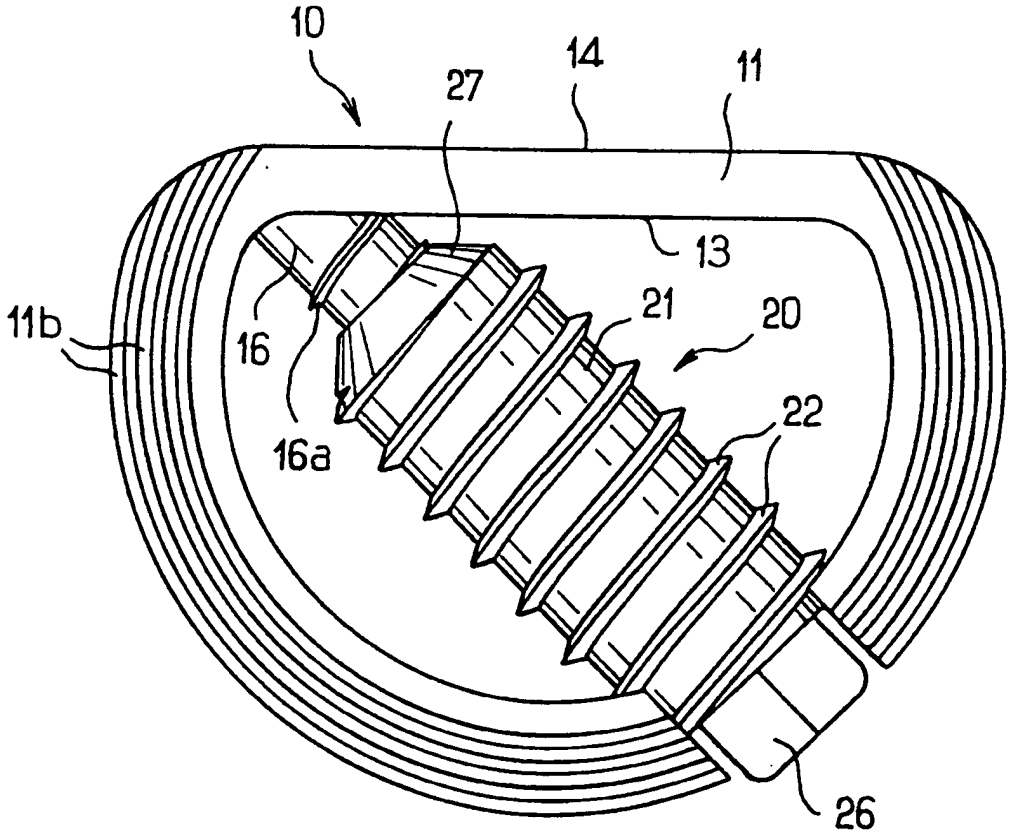
26
12b

FIG_10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16a
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FIG_11

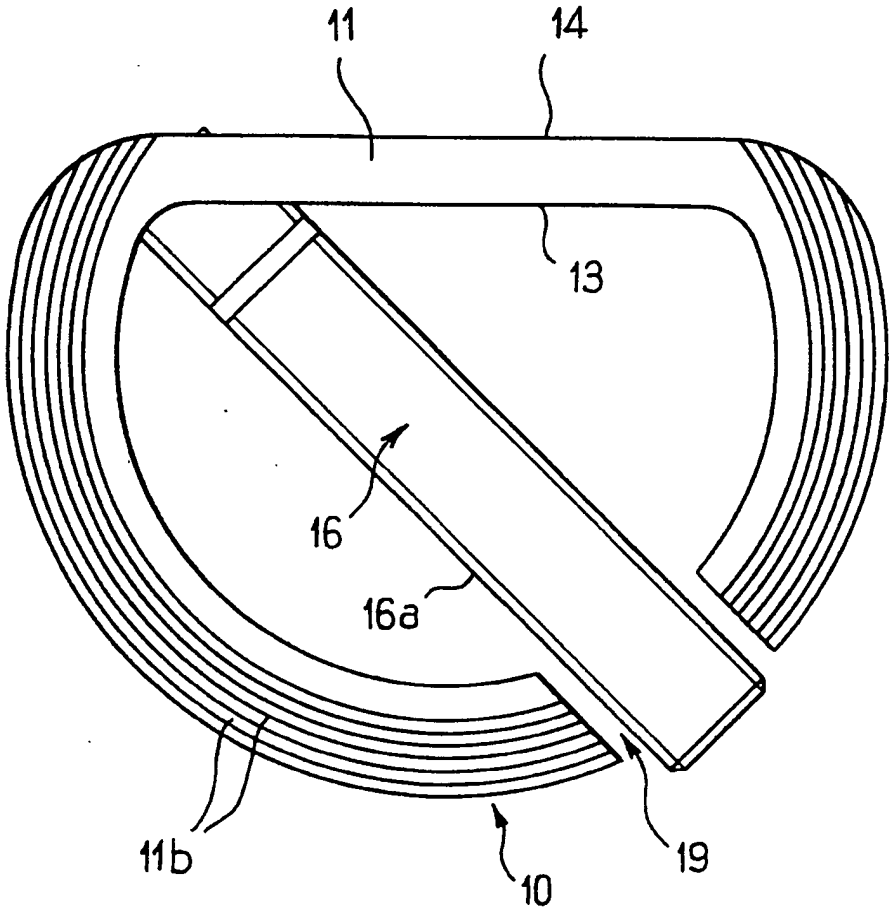


FIG_12

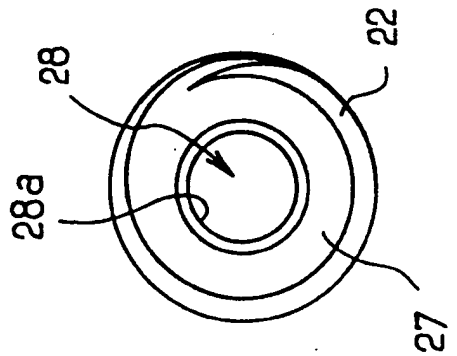


FIG.14

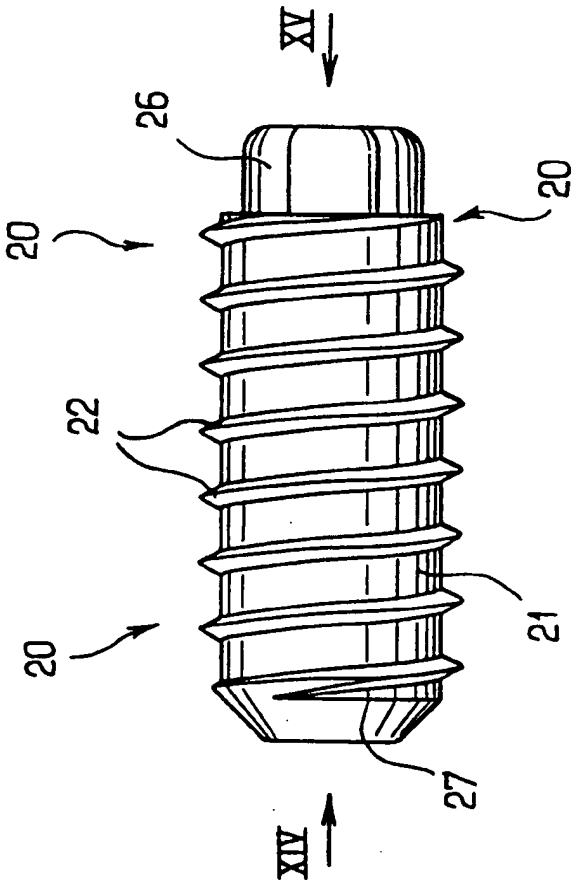


FIG.13

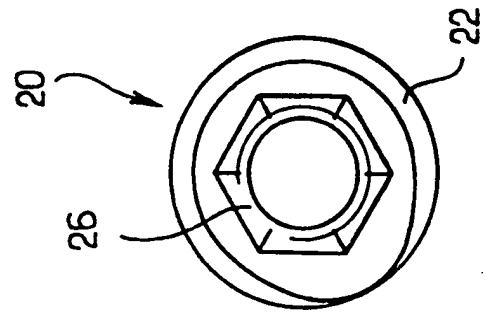
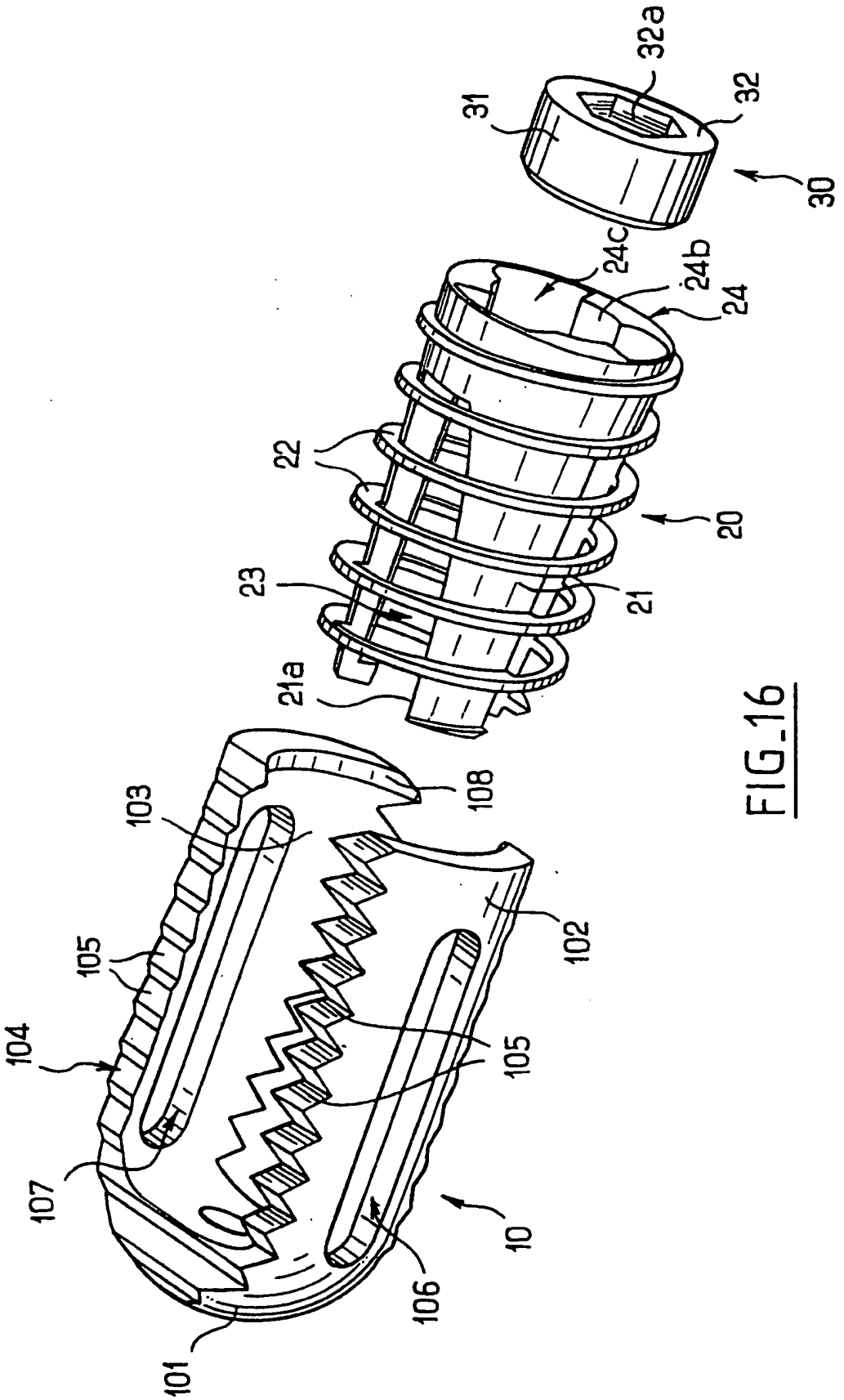


FIG.15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21a
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FIG_16

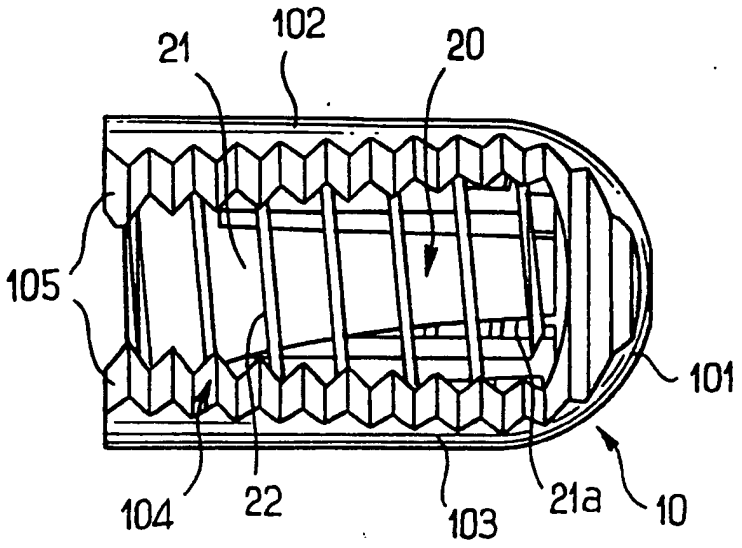


FIG_18

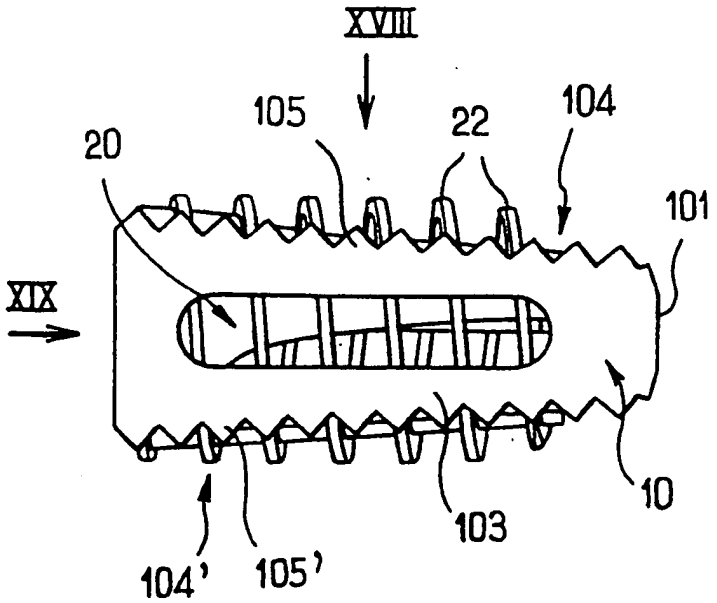


FIG_17

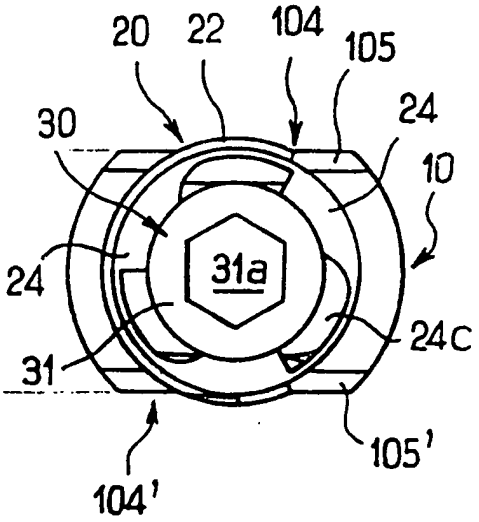


FIG_19

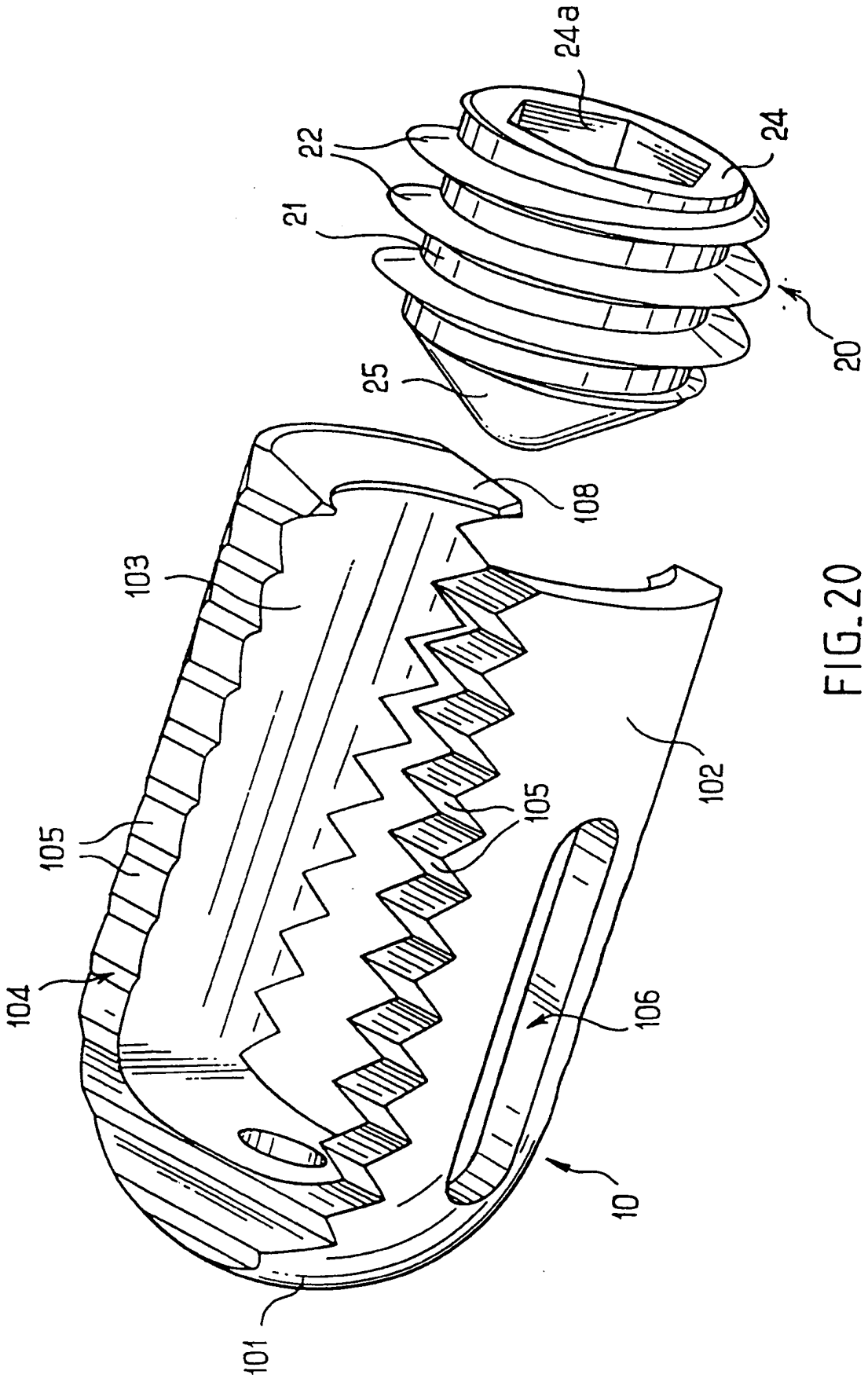


FIG.20

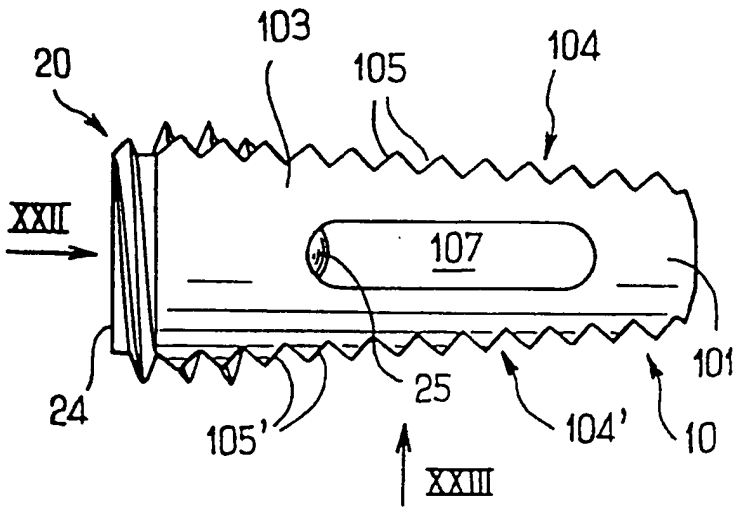


FIG_21

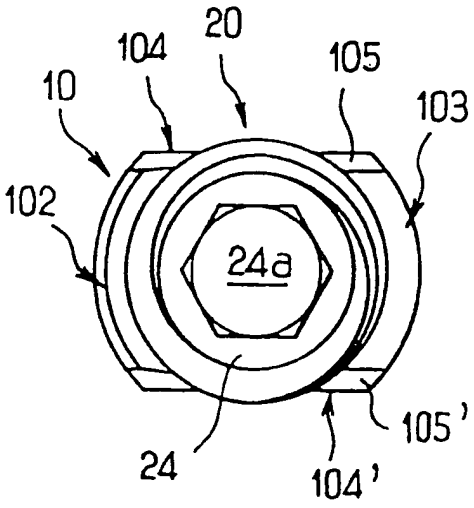


FIG_22

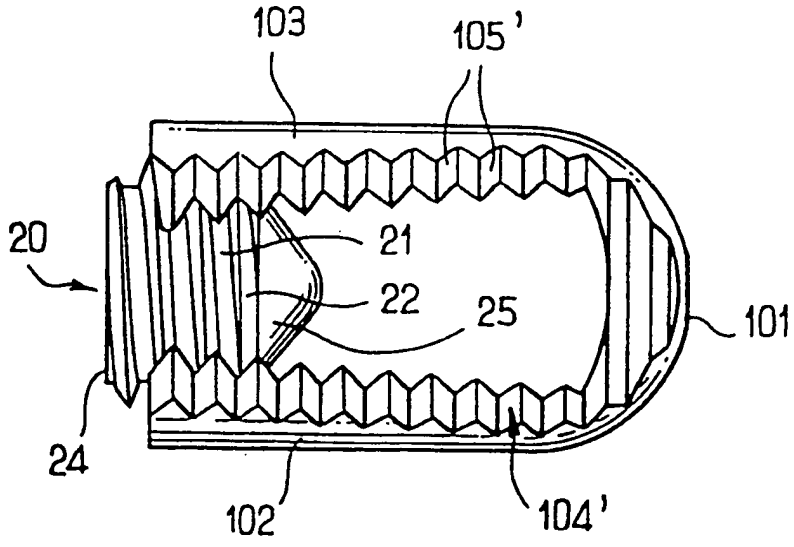
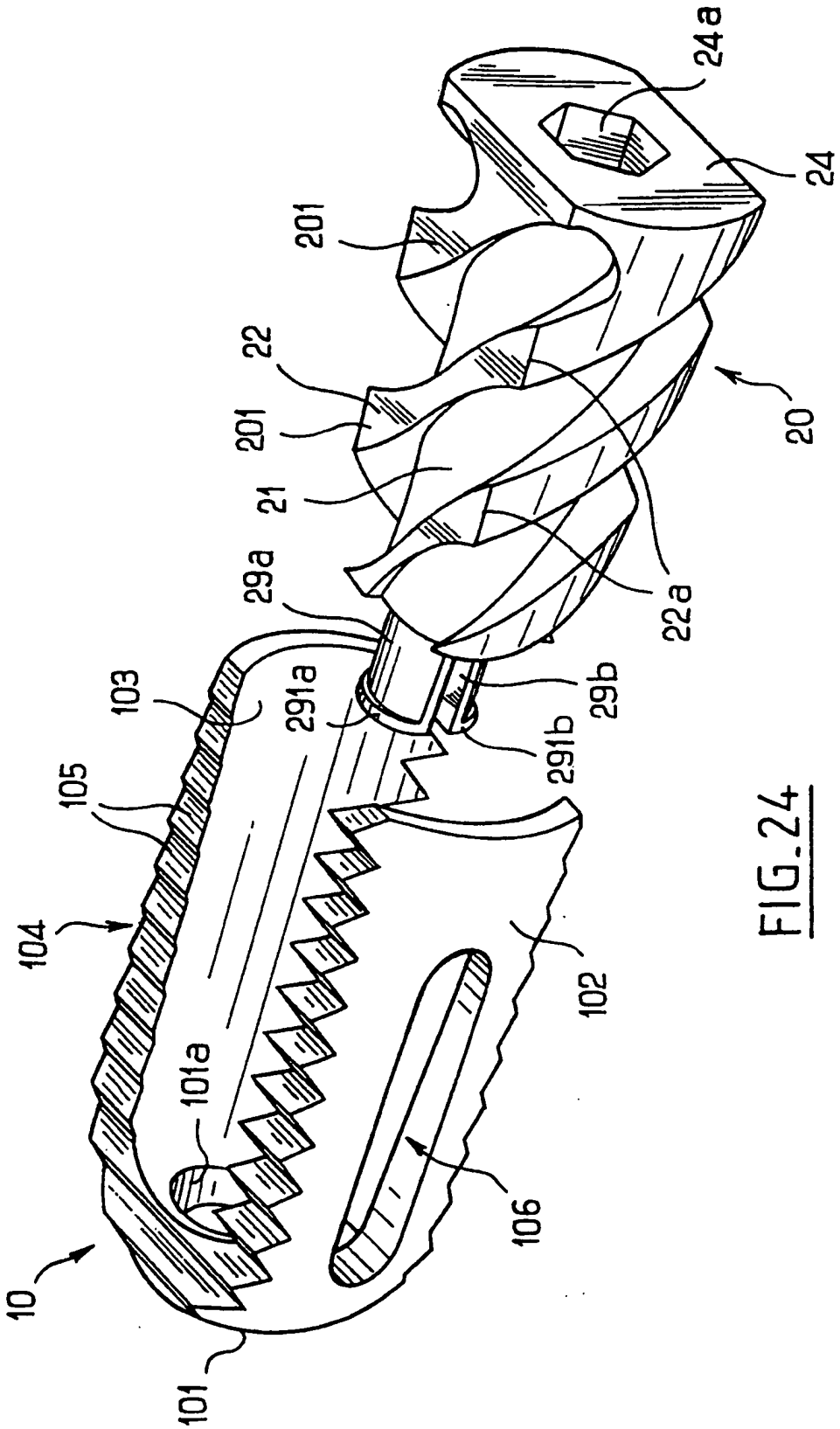


FIG_23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291a
29b
291b
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104
102
101a
106
10
101

FIG.24

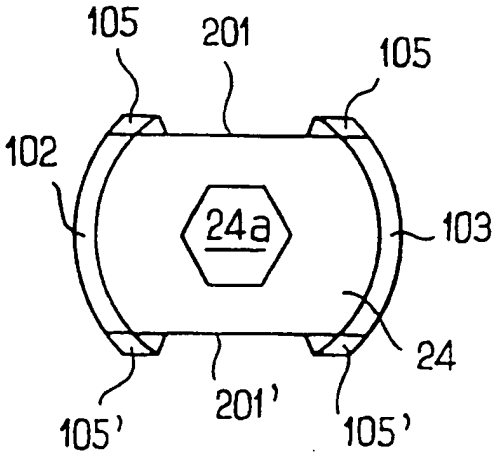


FIG_26

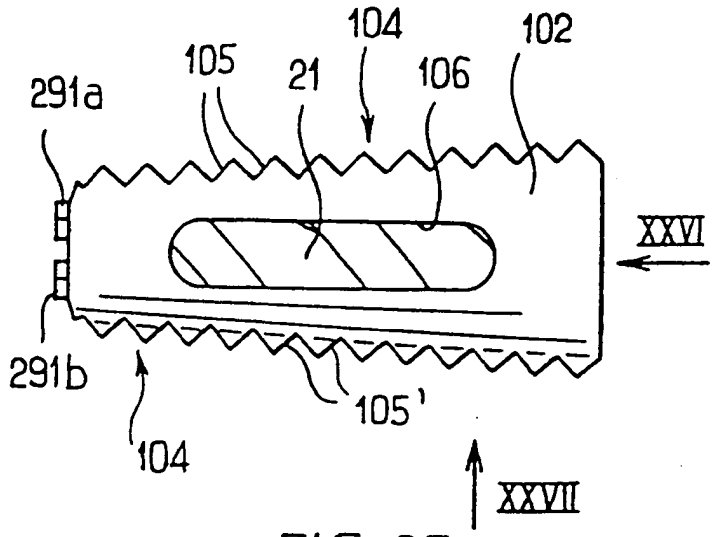


FIG_25

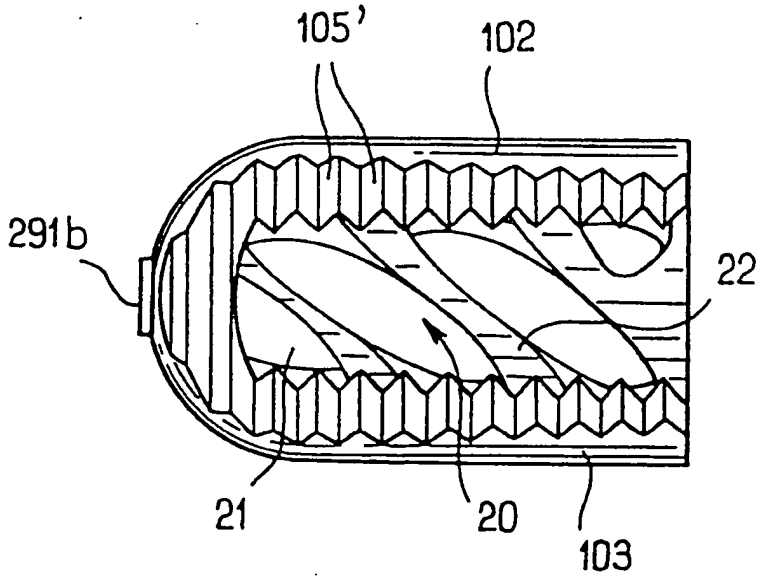
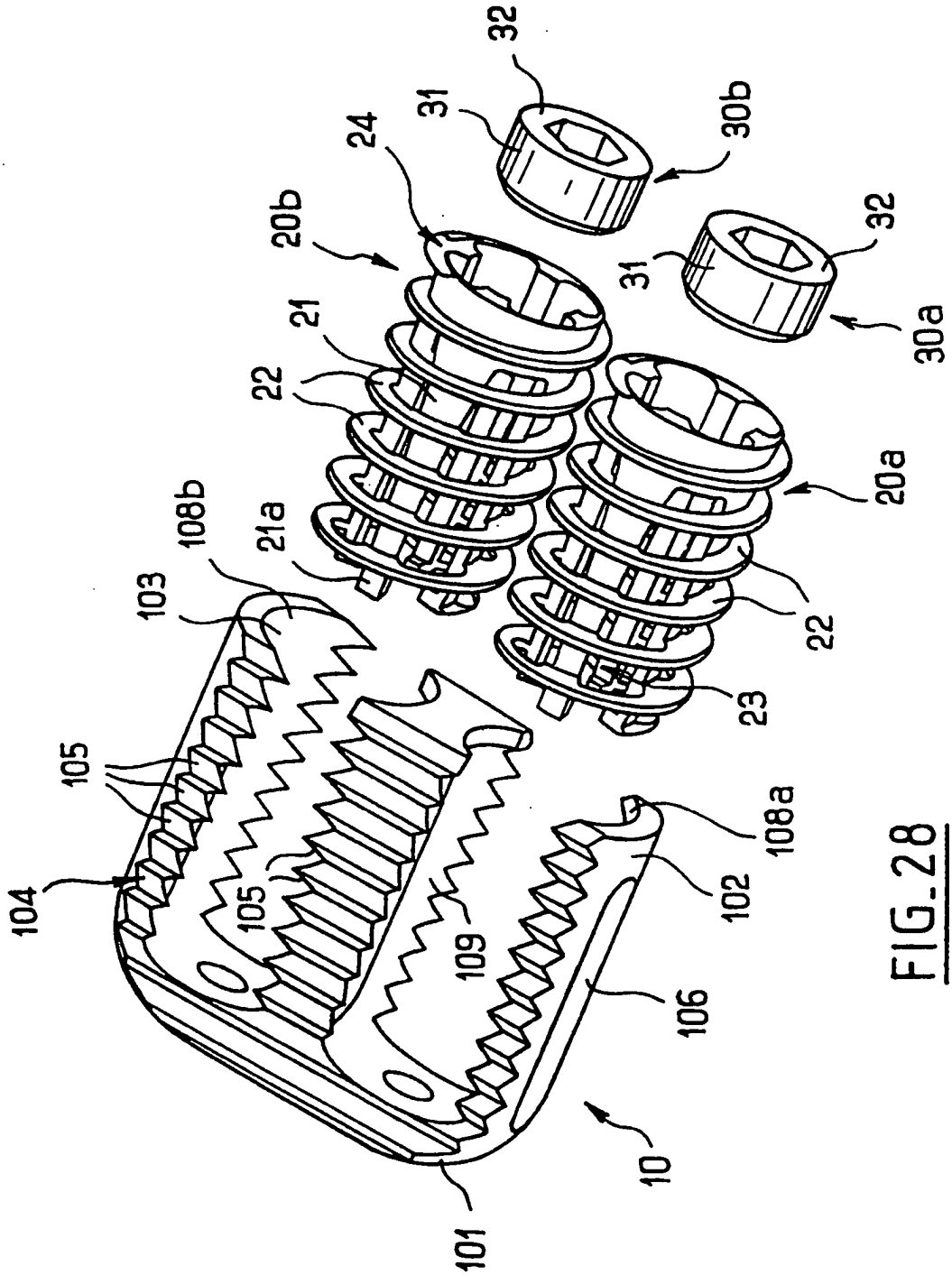


FIG_27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30a
20a
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FIG.28

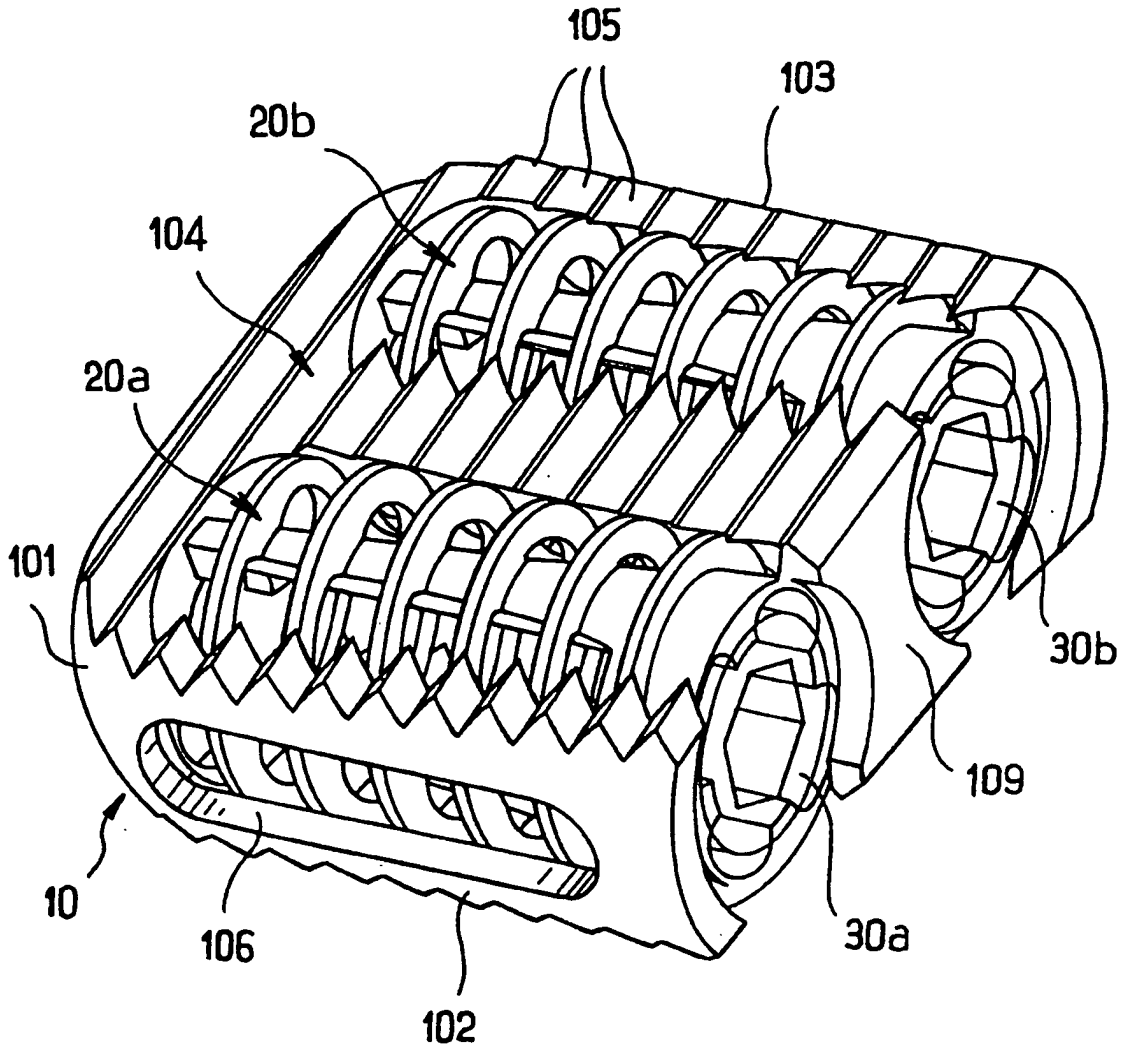


FIG_29

FIG_30

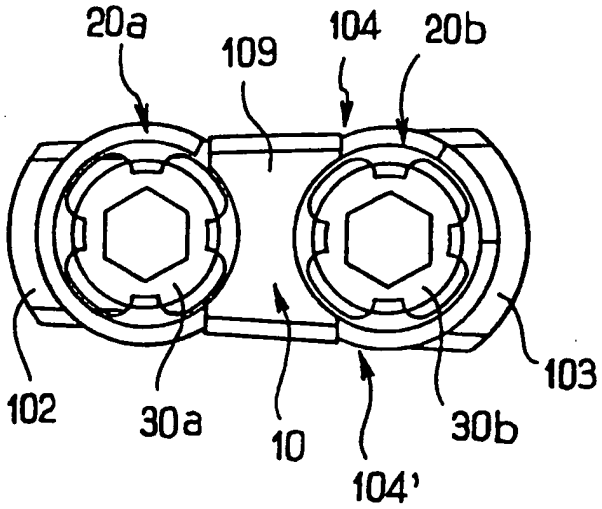


FIG_31

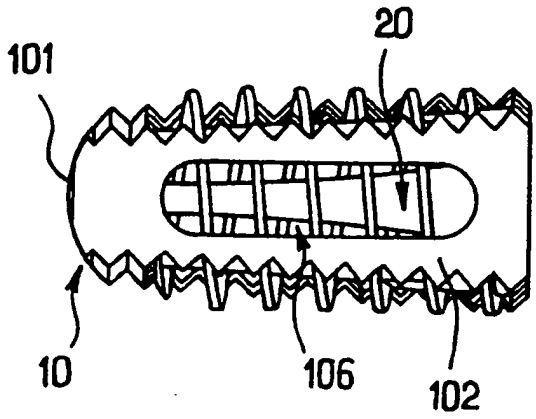
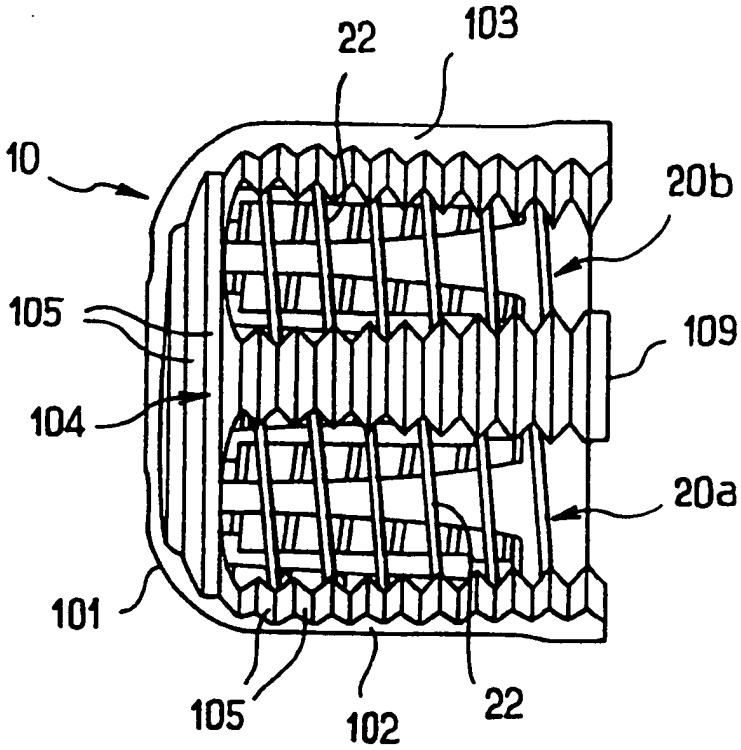
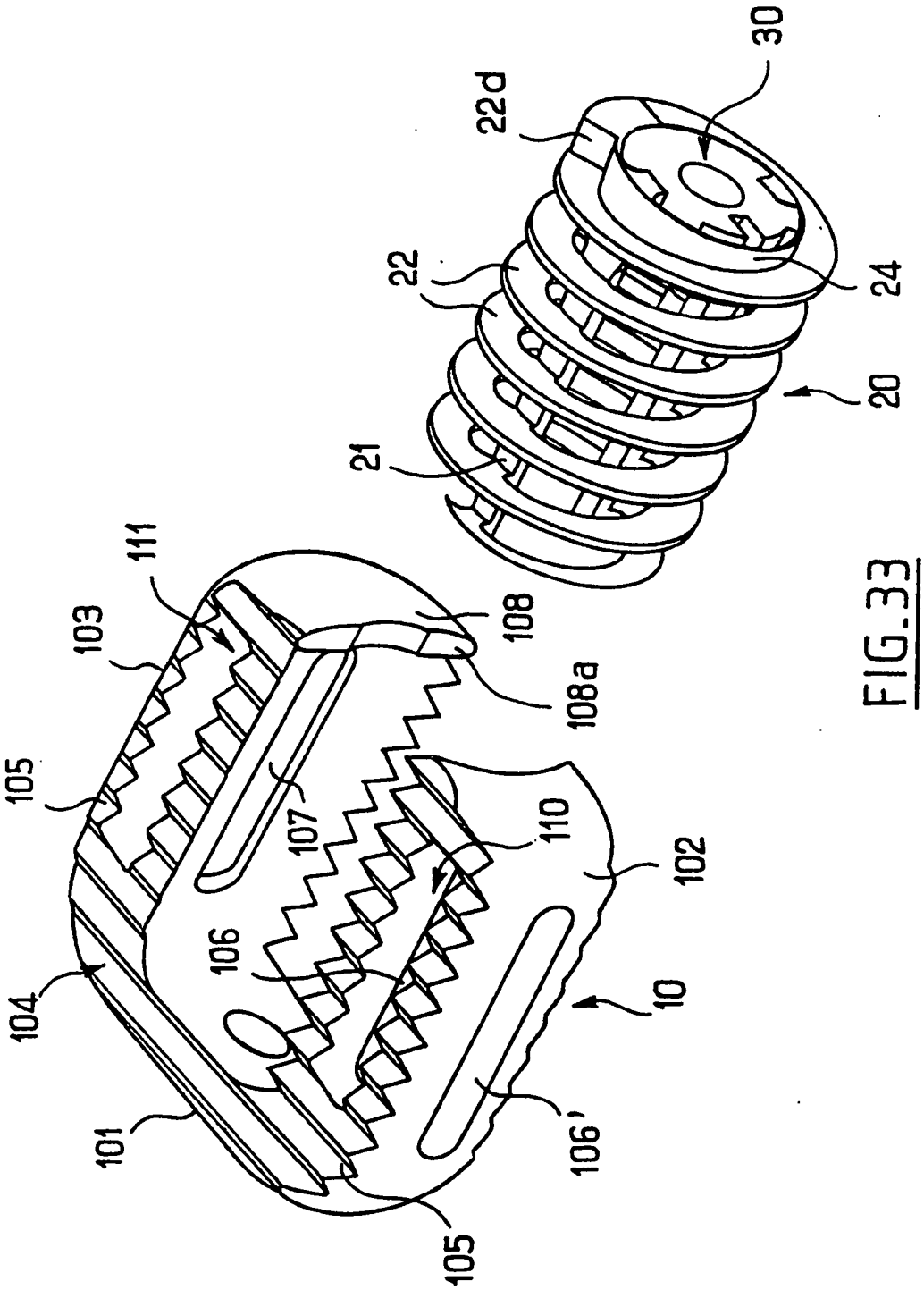


FIG_32

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22d
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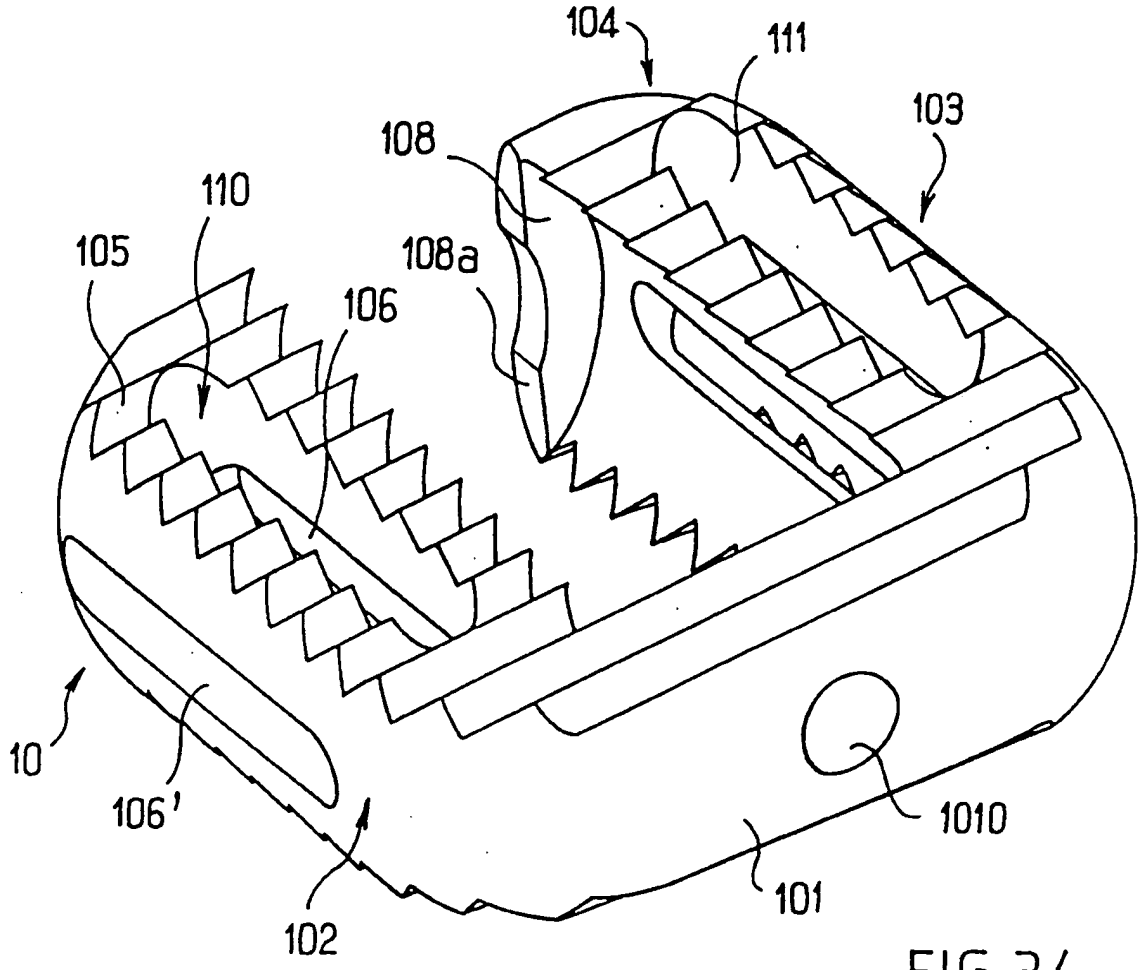
102
106
104
10
101
106'
105

FIG.33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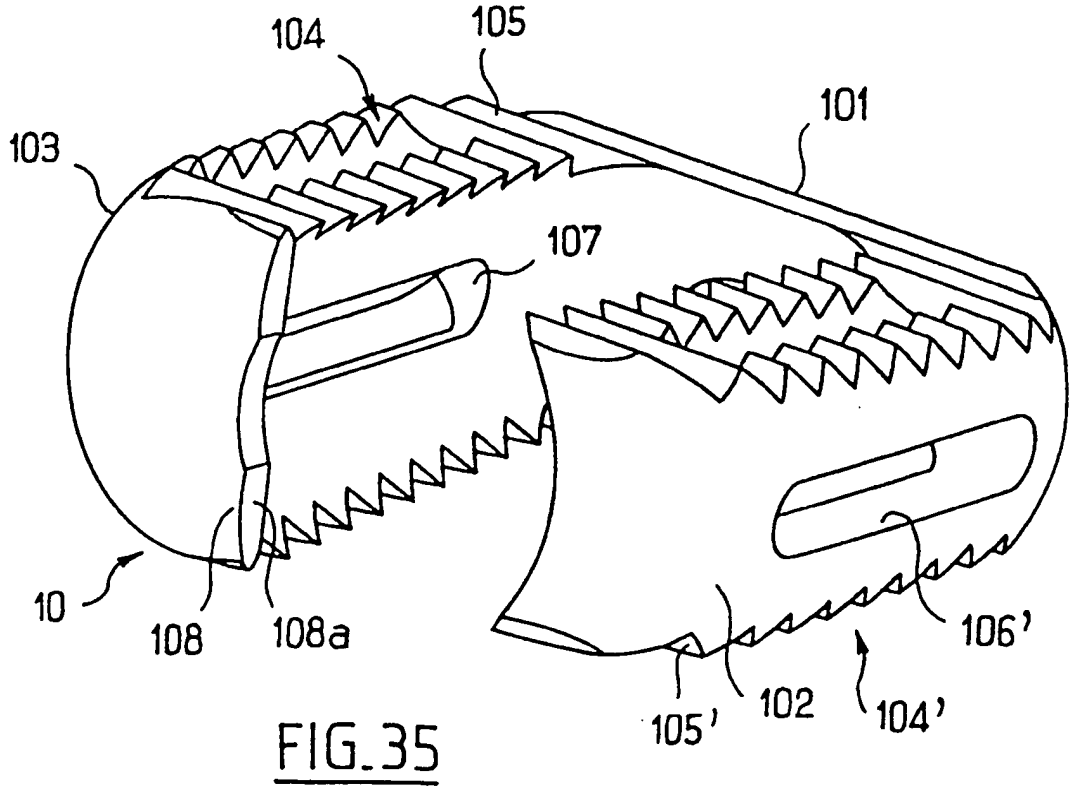
106'
1010
101
102

FIG.34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107
10
108
108a
106'
105'
102
104'

FIG.35

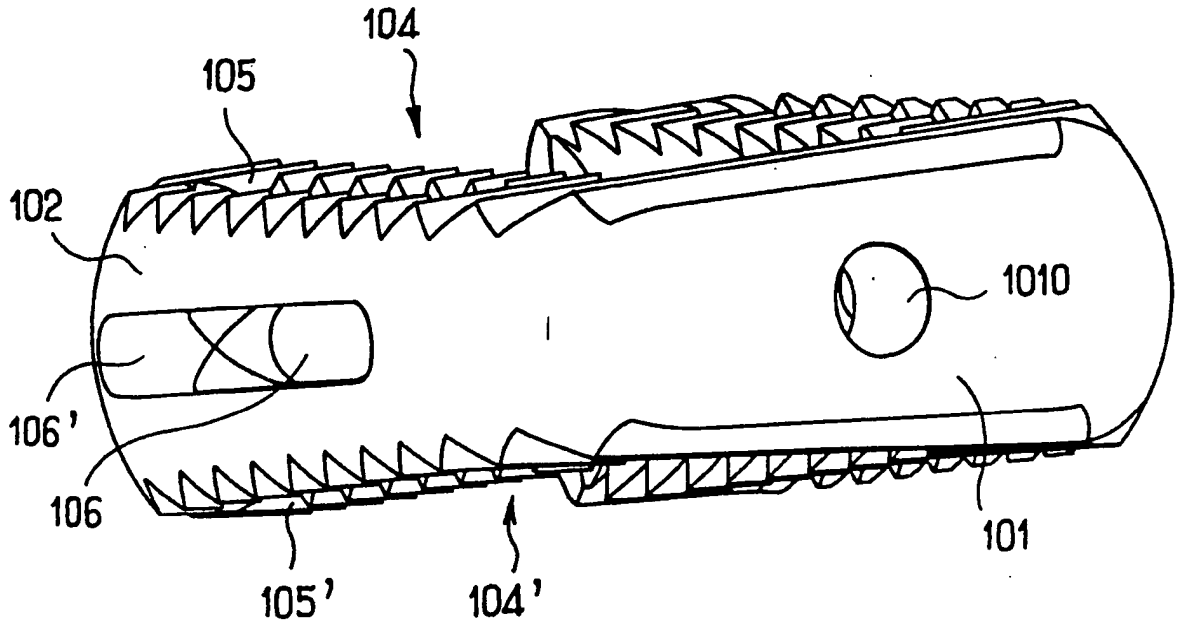


FIG.36

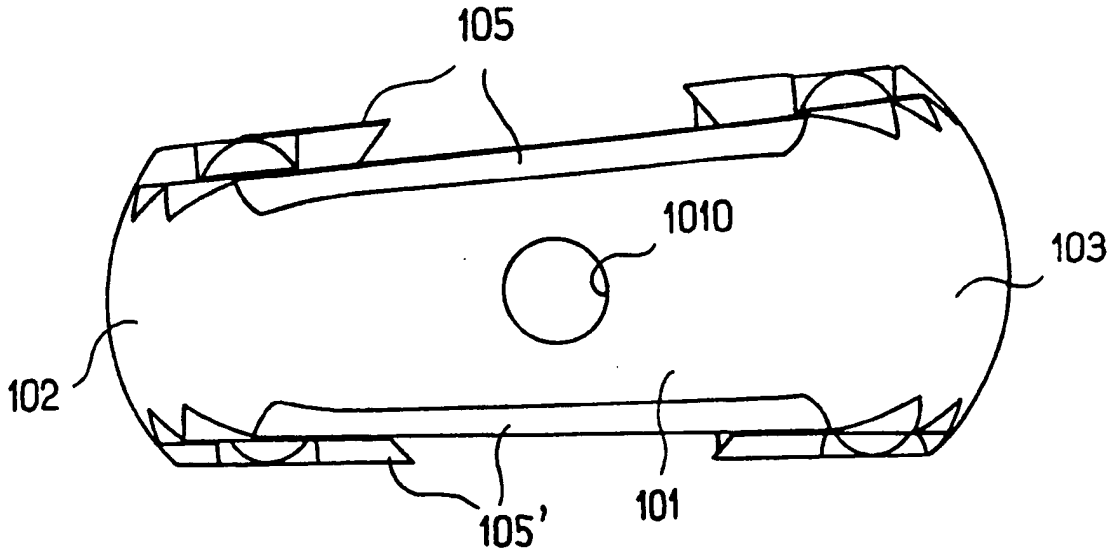


FIG.37

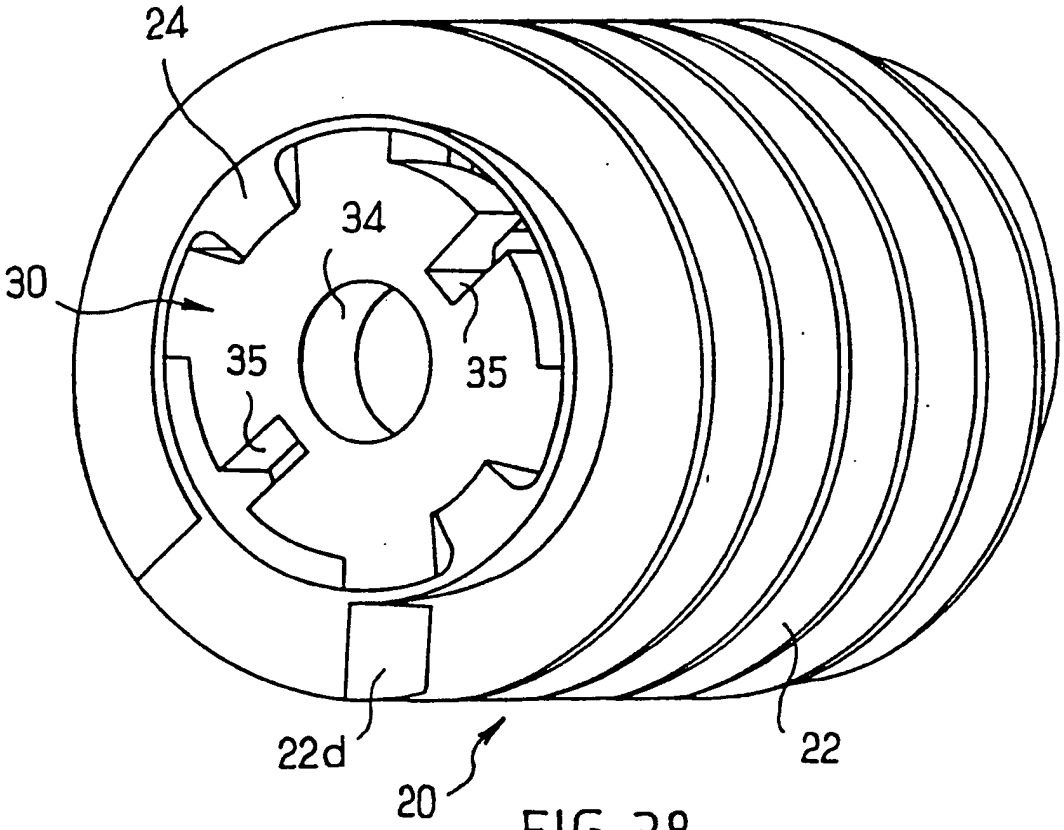


FIG_38

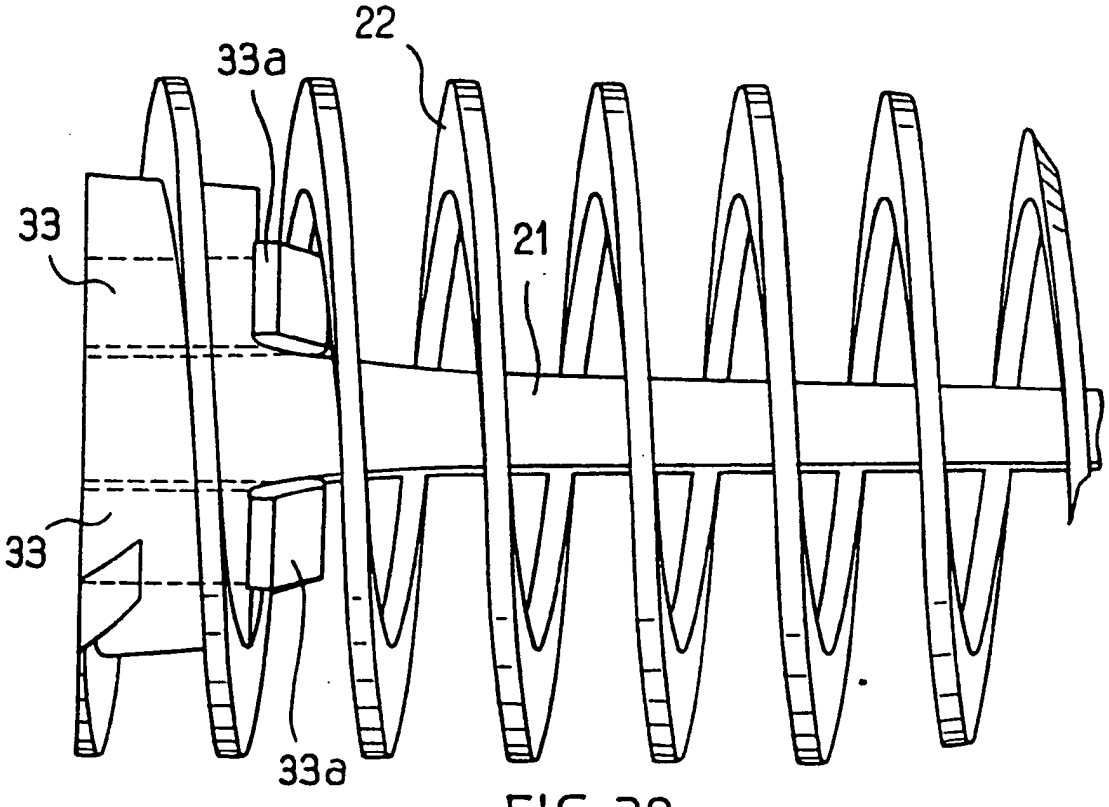


FIG_39

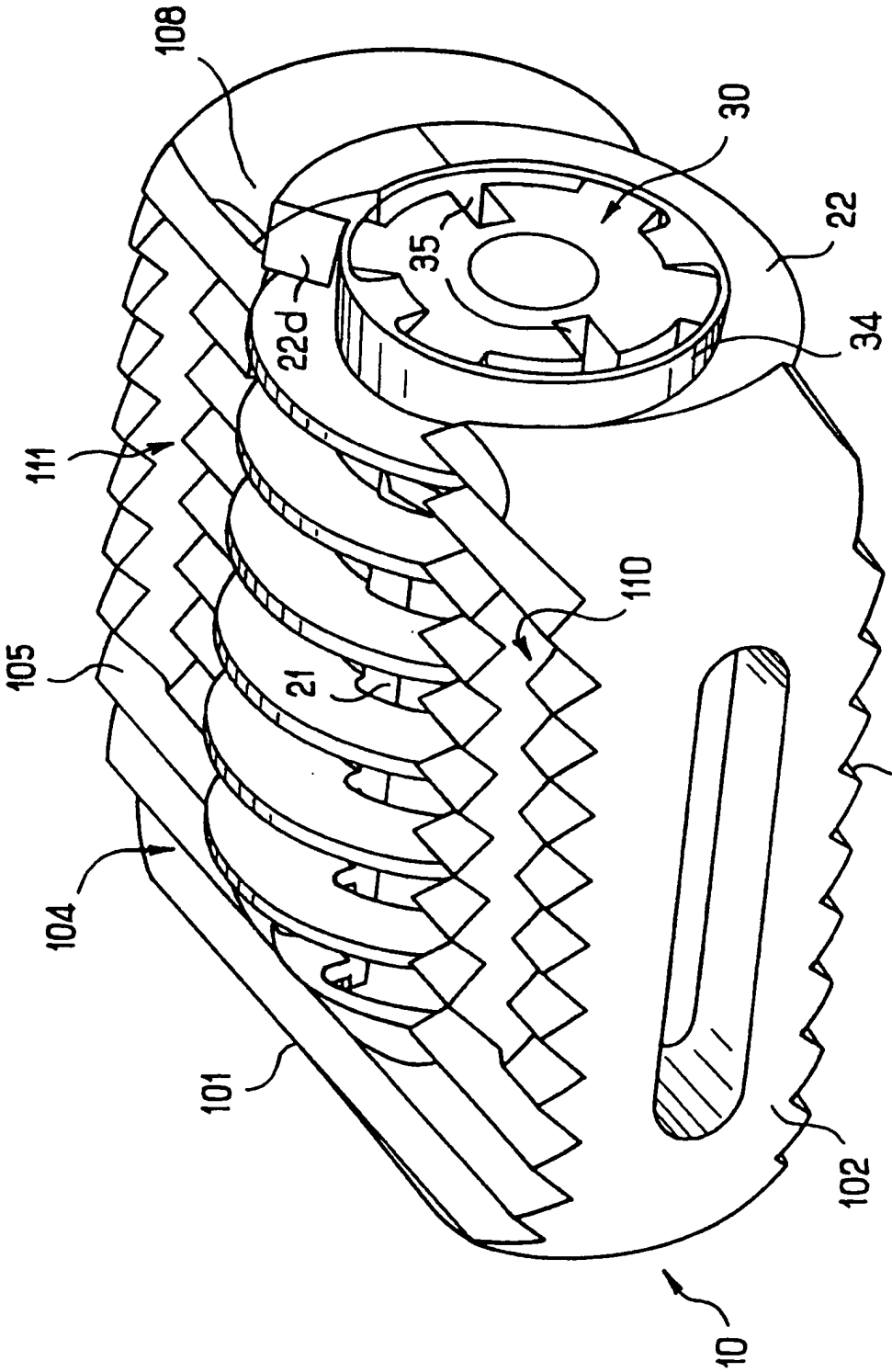


FIG.40

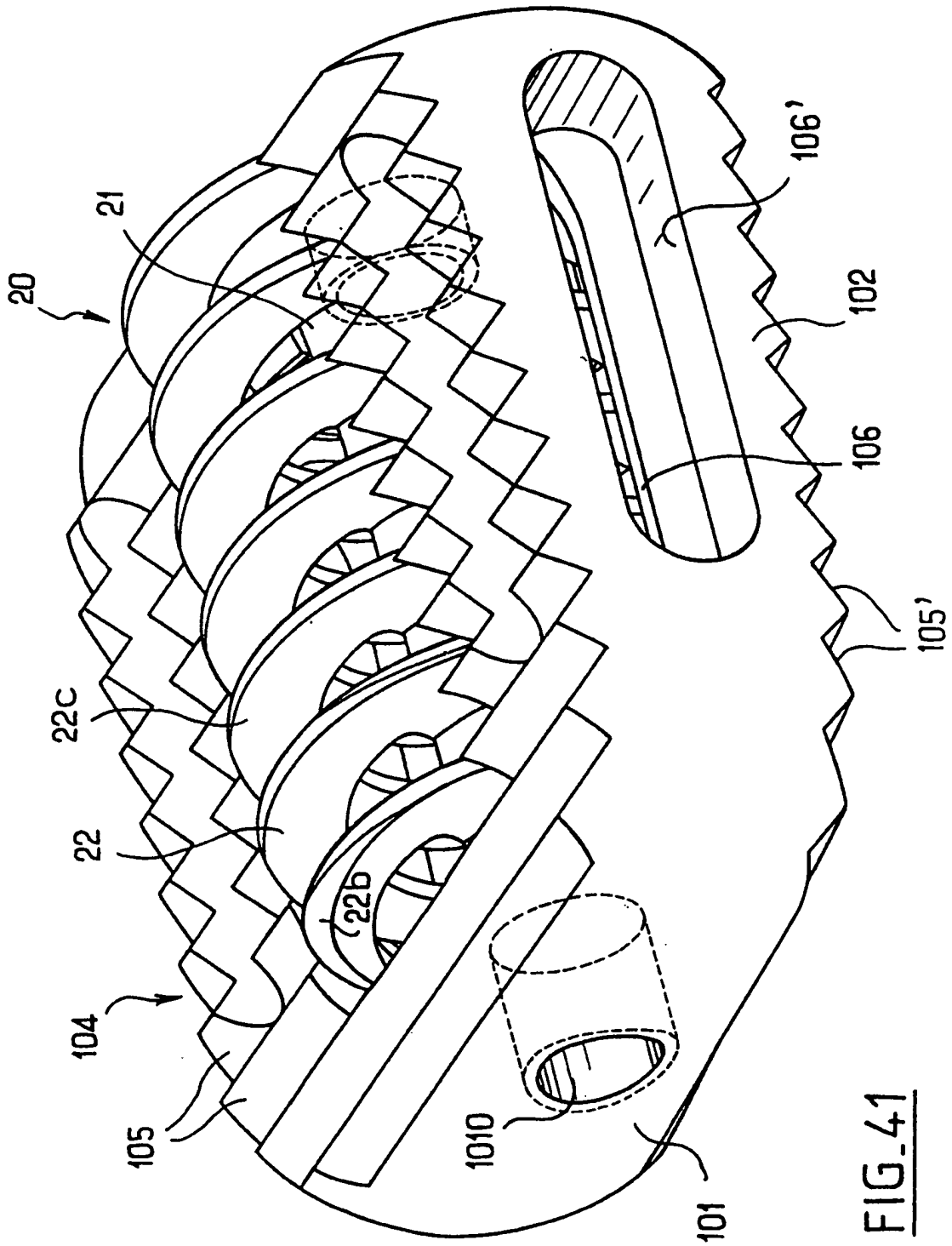
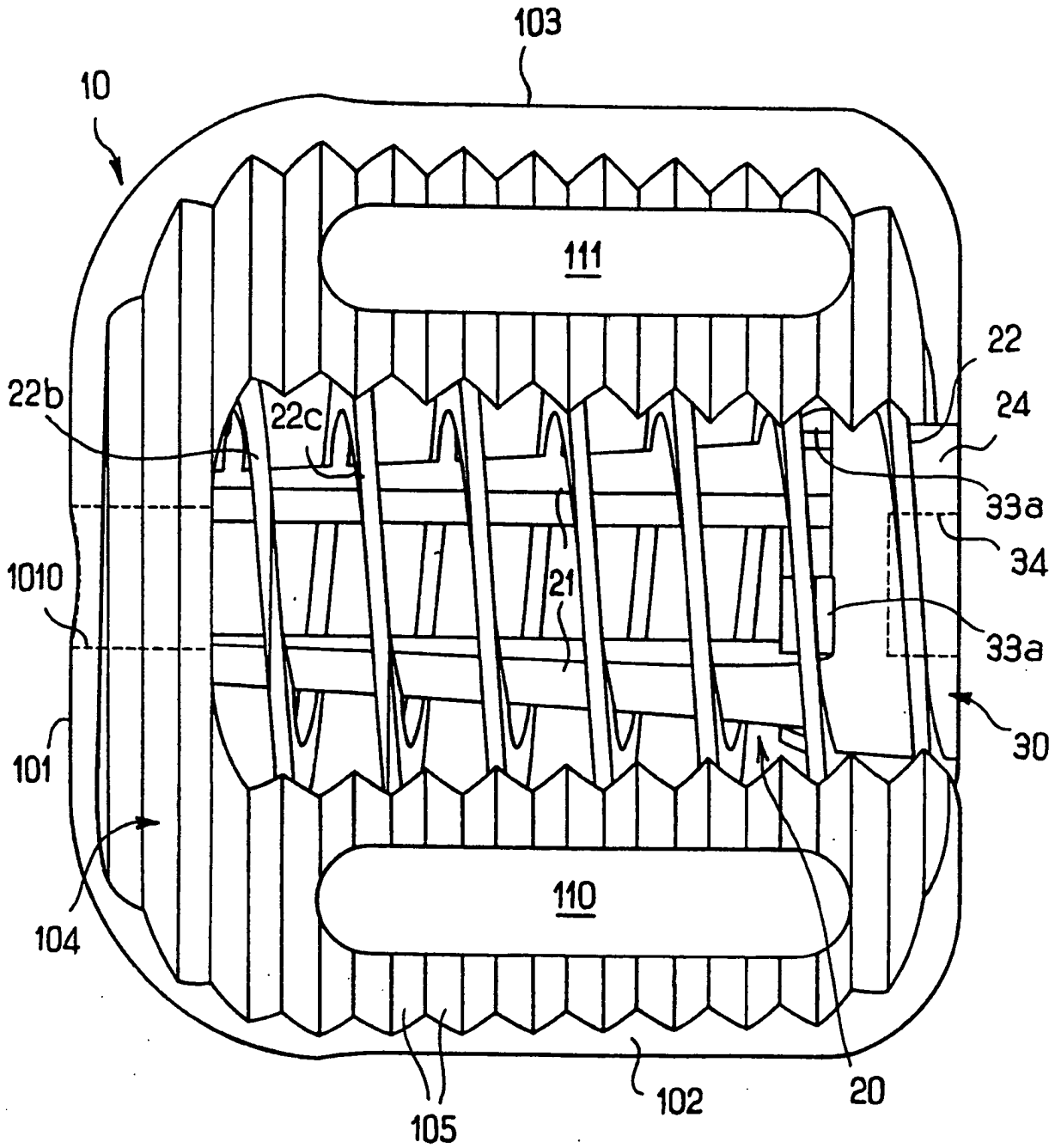


FIG_41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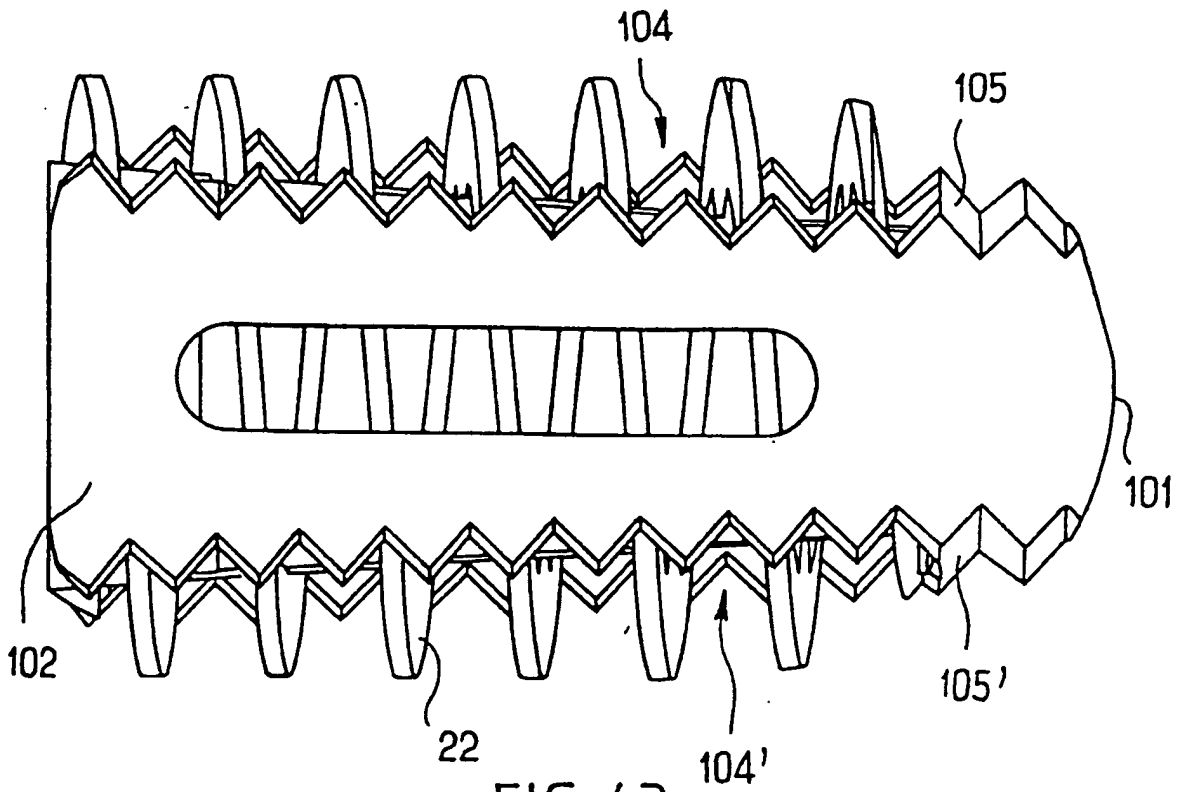
105
102
20

FIG.42


104
105
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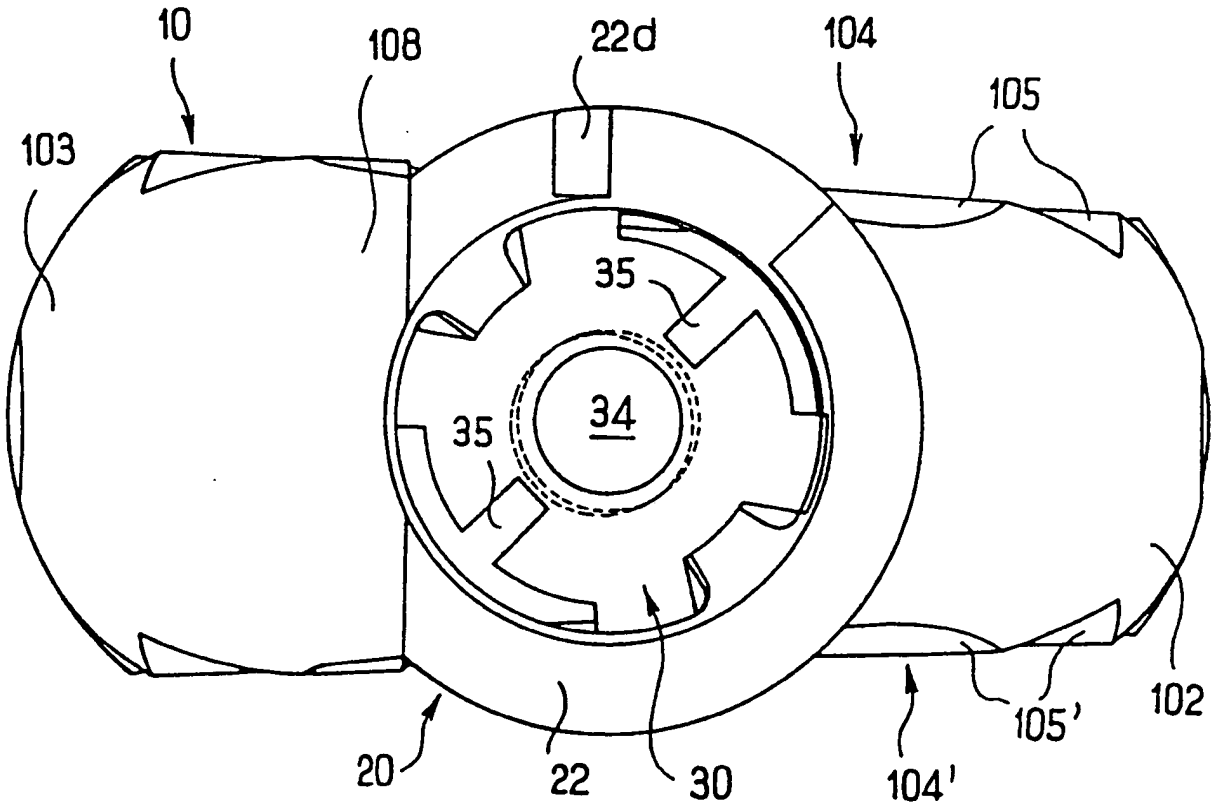
102
22
104'
105'

FIG_43


10
108
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103
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35
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22
30
104'
105'
102

FIG_44

INTERNATIONAL SEARCH REPORT

Internat J Application No
PCT/FR 98/00825

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F2/44 A61B17/86

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	DE 296 12 269 U (AESCULAP) 12 September 1996 see the whole document --- WO 96 14809 A (ATLAS IMPLANTS) 23 May 1996 see the whole document ---	11,12, 15,24,34 1-5,9, 10,21, 39,52 37,48, 54-56 1,2,4,5, 10
Y	FR 2 710 519 A (ROBINE) 7 April 1995 see the whole document ---	3,9
Y	DE 44 09 392 A (BIEDERMANN MOTECH) 21 September 1995 see the whole document --- -/--	21

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 September 1998	16 September 1998 (16.09.98)

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Klein, C

2

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FR 98/00825

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 716 840 A (SURGICAL DYNAMICS) 19 June 1996 (19.06.96)	39
A	see abstract; figures 1,5,10,17,24	17
Y	EP 0 732 093 A (SOFAMOR DANEK GROUP) 18 September 1996 (18 .09.96)	52
A	see the whole document	50
P,X	WO 97 15246 A (SYNTHES AG CHUR) 1 May 1997 (01.05.97)	1,2,4,5, 11,23, 28,29,42
A	see the whole document	40
A	US 5 458 638 A (KUSLICH) 17 October 1995 (17.10.95) see figures 10,12,19,23	37,38, 48,49
A	FR 2 703 580 A (ROBERT) 14 October 1994 (14.10.94) cited in the request see the whole document	52,54,55
A	FR 2 727 004 A (EUROS) 24 May 1996 (24.05.96) see page 3, line 15 - line 20; figures	56,60
A	DE 295 19 418 U (DIEHL) 23 May 1996 (23.05.96)	
A	EP 0 664 994 A (BIOMAT) 2 August 1995 (02.08.95)	
A	FR 2 727 003 A (EUROS) 24 May 1996 (24.05.96)	
A	FR 2 724 312 A (ALBY) 15 March 1996 (15.03.96)	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FR 98/00825

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.: 63, 64
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Methods for treatment of the human or animal body by surgery

2. [ ] Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/FR 98/00825

Patent document cited in search report	Publication date	Patent familiy member(s)	Publication date
DE 29612269 U	12-09-1996	DE 19628473 C	23-04-1998
		WO 9802117 A	22-01-1998
WO 9614809 A	23-05-1996	FR 2726759 A	15-05-1996
		EP 0793463 A	10-09-1997
FR 2710519 A	07-04-1995		
DE 4409392 A	21-09-1995	WO 9525486 A	28-09-1995
EP 716840 A	19-06-1996	AU 3505395 A	29-03-1996
		AU 4035395 A	20-06-1996
		CA 2164922 A	12-06-1997
		CA 2199637 A	21-03-1996
		EP 0781113 A	02-07-1997
		JP 8215225 A	27-08-1996
		WO 9608205 A	21-03-1996
EP 732093 A	18-09-1996	US 5593409 A	14-01-1997
		AU 4445196 A	29-08-1996
		CA 2168835 A	30-04-1994
		CN 1134810 A	06-11-1996
		JP 8266563 A	15-10-1996
		US 5785710 A	28-07-1998
WO 9715246 A	01-05-1997	EP 0857041 A	12-08-1998
US 5458638 A	17-10-1995	US 5489308 A	06-02-1996
		CA 2015507 A	06-01-1991
FR 2703580 A	14-10-1994		
FR 2727004 A	24-05-1996		
DE 29519418 U	23-05-1996		
EP 664994 A	02-08-1995	FR 2715293 A	28-07-1995
		CA 2140944 A	27-07-1995
		JP 2669379 B	27-10-1997
		JP 7213533 A	15-08-1995

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/FR 98/00825

Patent document cited in search report	Publication date	Patent familiy member(s)	Publication date
EP 664994 A		US 5554191 A	10-09-1996
FR 2727003 A	24-05-1996		
FR 2724312 A	15-03-1996		

RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale n°
PCT/FR 98/00825

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
IPC 6 A61F2/44 A61B17/86

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
IPC 6 A61F

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie*	Documents cités avec, le cas échéant, l'indication des passages pertinents	n° des revendications visées
X Y A	DE 296 12 269 U (AESCULAP) 12 septembre 1996 (12.09.96) voir le document en entier --- WO 96 14809 A (ATLAS IMPLANTS) 23 May 1996 voir le document en entier --- FR 2 710 519 A (ROBINE) 7 April 1995 --- DE 44 09 392 A (BIEDERMANN MOTECH) 21 September 1995 voir le document en entier --- -/--	11,12, 15,24,34 1-5,9, 10,21, 39,52 37,48, 54-56 1,2,4,5, 10 3,9 21

[X] Voir la suite du cadre C pour la fin de la liste des documents.

[X] Les documents de familles de brevets sont indiqués en annexe.

* Catégories spéciales de documents cités :
"A" document définissant l'état général de la technique, n'étant pas considéré comme particulièrement pertinent
"E" document antérieur, mais publié à la date de dépôt international ou après cette date
"L" document pouvant jeter un doute sur une revendication de priorité ou cité pour déterminer la date de publication d'une autre citation ou pour une raison spéciale (telle qu'indiquée)
"O" document se référant à une divulgation orale, à un usage, à une exposition ou tous autres moyens
"P" document publié avant la date de dépôt international, mais après la date de priorité revendiquée
"T" document ultérieur publié après la date de dépôt international ou la date de priorité et n'appartenant pas à l'état de la technique pertinent, mais cité pour permettre de comprendre le principe ou la théorie constituant la base de l'invention
"X" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive par rapport au document considéré isolément
"Y" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier
"&" document qui fait partie de la même famille de brevets

Date à laquelle la recherche a été effectivement achevée	Date d'expédition du rapport de recherche
8 Septembre 1998 (08.09.98)	16 Septembre 1998 (16.09.98)

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
EUROPEAN PATENT OFFICE n° de télécopieur	n° de téléphone

RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale No
PCT/FR 98/00825

C.(suite) DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie *	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
Y	EP 0 716 840 A (SURGICAL DYNAMICS) 19 juin 1996	39
A	voir abrégé; figures 1,5,10,17,24	17
Y	EP 0 732 093 A (SOFAMOR DANEK GROUP) 18 septembre 1996	52
A	voir le document en entier	50
P,X	WO 97 15246 A (SYNTHES AG CHUR) 1 mai 1997	1,2,4,5, 11,23, 28,29,42
A	voir le document en entier	40
A	US 5 458 638 A (KUSLICH) 17 octobre 1995	37,38, 48,49
	voir figures 10,12,19,23	
A	FR 2 703 580 A (ROBERT) 14 octobre 1994 cité dans la demande voir le document en entier	52,54,55
A	FR 2 727 004 A (EUROS) 24 mai 1996 voir page 3, ligne 15 - ligne 20; figures	56,60
A	DE 295 19 418 U (DIEHL) 23 mai 1996	
A	EP 0 664 994 A (BIOMAT) 2 août 1995	
A	FR 2 727 003 A (EUROS) 24 mai 1996	
A	FR 2 724 312 A (ALBY) 15 mars 1996	

2

RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale n° PCT/FR 98/00825

Cadre I Observations - lorsqu'il a été estimé que certaines revendications ne pouvaient pas faire l'objet d'une recherche (suite du point 1 de la première feuille)

Conformément à l'article 17.2)a), certaines revendications n'ont pas fait l'objet d'une recherche pour les motifs suivants:

1. [X] Les revendications n°s 63,64
se rapportent à un objet à l'égard duquel l'administration n'est pas tenue de procéder à la recherche, à savoir:

Règle 39.1(iv) PCT - Méthode de traitement chirurgical du corps humain ou animal

2. [ ] Les revendications n°s
se rapportent à des parties de la demande internationale qui ne remplissent pas suffisamment les conditions prescrites pour qu'une recherche significative puisse être effectuée, en particulier:

3. [ ] Les revendications n°s
sont des revendications dépendantes et ne sont pas rédigées conformément aux dispositions de la deuxième et de la troisième phrases de la règle 6.4.a).

Cadre II Observations - lorsqu'il y a absence d'unité de l'invention (suite du point 2 de la première feuille)

L'administration chargée de la recherche internationale a trouvé plusieurs inventions dans la demande internationale, à savoir:

1. [ ] Comme toutes les taxes additionnelles ont été payées dans les délais par le déposant, le présent rapport de recherche internationale porte sur toutes les revendications pouvant faire l'objet d'une recherche.

2. [ ] Comme toutes les recherches portant sur les revendications qui s'y prêtaient ont pu être effectuées sans effort particulier justifiant une taxe additionnelle, l'administration n'a sollicité le paiement d'aucune taxe de cette nature.

3. [ ] Comme une partie seulement des taxes additionnelles demandées a été payée dans les délais par le déposant, le présent rapport de recherche internationale ne porte que sur les revendications pour lesquelles les taxes ont été payées, à savoir les revendications n°s

4. [ ] Aucune taxe additionnelle demandée n'a été payée dans les délais par le déposant. En conséquence, le présent rapport de recherche internationale ne porte que sur l'invention mentionnée en premier lieu dans les revendications; elle est couverte par les revendications n°s

Remarque quant à la réserve

[ ] Les taxes additionnelles étaient accompagnées d'une réserve de la part du déposant.

[ ] Le paiement des taxes additionnelles n'était assorti d'aucune réserve.

RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs aux membres de familles de brevets

Demande internationale No
PCT/FR 98/00825

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
DE 29612269 U	12-09-1996	DE 19628473 C	23-04-1998
		WO 9802117 A	22-01-1998
WO 9614809 A	23-05-1996	FR 2726759 A	15-05-1996
		EP 0793463 A	10-09-1997
FR 2710519 A	07-04-1995	AUCUN	
DE 4409392 A	21-09-1995	WO 9525486 A	28-09-1995
EP 716840 A	19-06-1996	AU 3505395 A	29-03-1996
		AU 4035395 A	20-06-1996
		CA 2164922 A	12-06-1997
		CA 2199637 A	21-03-1996
		EP 0781113 A	02-07-1997
		JP 8215225 A	27-08-1996
		WO 9608205 A	21-03-1996
EP 732093 A	18-09-1996	US 5593409 A	14-01-1997
		AU 4445196 A	29-08-1996
		CA 2168835 A	30-04-1994
		CN 1134810 A	06-11-1996
		JP 8266563 A	15-10-1996
		US 5785710 A	28-07-1998
WO 9715246 A	01-05-1997	EP 0857041 A	12-08-1998
US 5458638 A	17-10-1995	US 5489308 A	06-02-1996
		CA 2015507 A	06-01-1991
FR 2703580 A	14-10-1994	AUCUN	
FR 2727004 A	24-05-1996	AUCUN	
DE 29519418 U	23-05-1996	AUCUN	
EP 664994 A	02-08-1995	FR 2715293 A	28-07-1995
		CA 2140944 A	27-07-1995
		JP 2669379 B	27-10-1997
		JP 7213533 A	15-08-1995

RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs aux membres de familles de brevets

Demande internationale No
PCT/FR 98/00825

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
EP 664994 A		US 5554191 A	10-09-1996
FR 2727003 A	24-05-1996	AUCUN	
FR 2724312 A	15-03-1996	AUCUN	

Result Page

IMPLANTS INTERSOMATIQUES IN TWO PORTIONS

The present invention milked generally with the usable implants intersomatic in the surgical treatment of the rachis.

One knows already very numerous implants intersomatic.

One knows in particular implants of more or less complex structure, carried out in several portions particularly to confer certain characteristics of deformability to them. These known implants are désavantageux in what they are more expensive and difficult to manufacture, and which poses to them proves more delicate. They can suffer also from a problem of reliability in the long term.

One also knows implants which, so particularly mitigating whole or part of the disadvantages cidessus, presenting the shape of hollow body integral, or cages, provided with asperities on their faces upper and posterior to ensure a good initial locking compared to the vertebral plates overlying and underlying, their hollow character allowing an osseous growth through them and, in the long term, their definitive locking.

Learnedly the FR-A-2 703.580 described an example of such an implant.

These known implants integral, in spite of the presence of asperities which come to be anchored in the vertebral plates when the intervertebral distraction required with their placement is removed, can have in certain cases an insufficient stability, the quality of the anchoring, which is carried out by a single translation movement, being tributary particularly of the hardness of the bones.

One also knows by document DE-U- an implant which comprises an outer body in which can be engaged by screwing an inner element of reinforcement of anchoring, whose nets overflow audessus and below the faces upper and low this outer body.

The present invention aims at improving this type of known implant.

SUMMARY OF THE INVENTION

An implant for the surgery of the rachis includes/understands a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space. The implant includes/understands moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body.

To be opposed to the inverse movement of the aforesaid body out of the aforesaid intervertebral space, and thus to still improve the holding of the implant in position, the aforementioned hollow body has provided surfaces upper and low teeth on sharp board adapted to be anchored in the aforementioned vertebrae.

Preferably, the aforementioned teeth present a triangular transverse section.

According to another aspect, to improve compactness of the implant and to facilitate its placement, the aforementioned lateral walls of the hollow body are partially cylindrical and coaxial with an axis of the aforesaid reinforcing member of anchoring.

According to another aspect still, to support the osseous growth outside the implant, in particular laterally, the aforementioned lateral walls have through openings authorizing an osseous growth through them.

Advantageously, these openings include/understand lengthened slits extending substantially parallel to the direction from insertion of the aforesaid member in the aforementioned hollow body.

To give to the body a larger width, one can use for the lateral walls of the body of the thick walls in which second through openings are formed extending between the faces upper and low body. An osseous growth can also be caused between the two vertebral plates through these second through openings.

Preferentially, the aforementioned first through openings put in communication the aforementioned inner space with the aforementioned second through openings.

One can envisage moreover through openings putting in communication the aforementioned second through openings with the outer sides of the body.

According to another aspect of the invention, the hollow body has a wall of distal end connecting the aforementioned lateral walls, and this wall of distal end is round to facilitate insertion of the aforesaid body hollow in the aforementioned intervertebral space.

L invention also proposes an implant such as defined higher, in which the hollow body has a wall of distal end connecting the aforementioned lateral walls, and this wall of distal end has a tapped hole for temporary fixing of the aforesaid hollow body with an instrument of insertion of the body, for thus facilitating its placement by the surgeon.

▲ top

According to another aspect, the aforementioned projections of osseous anchoring include/understand a screw thread autotaraudor.

This threading can present a generally quadrangular radial section.

Preferentially, this present screw thread a radial section which progressively passes from a substantially triangular radial section to the aforementioned generally quadrangular radial section starting from the distal end of the aforesaid threading, while the diameter of the screw thread increases progressively starting from its distal end until a portion of substantially constant diameter.

One also proposes according to the invention an implant in which the aforementioned projections of osseous anchoring include/understand a screw thread in the shape of a helical strip encircling an inner space of the aforesaid reinforcing member of anchoring.

This helical strip is advantageously connected to a fork extending inside oe the aforementioned strip in an axial direction of the aforesaid member, and this fork includes/understands two legs preferably extending starting from a wall from proximate end of the aforesaid reinforcing member from anchoring.

The fork can include/understand legs also having an outer surface in the form of portion of truncated cone whose diameter decreases by the proximate end towards the distal end of the member. This makes it possible to compress a substance promotrice of osseous growth préalalement placed in the reinforcing member of anchoring, during the screwing of this last.

In alternative, the fork includes/understands at least two legs possessing each one a sharp edge of driver of the bone for thus accumulating chips of bone inside member 20 and facilitating osseous fusion.

I1 is preferable that the helical fork and strip are carried out of only one taking.

The invention also proposes an implant in which the projections of osseous anchoring include/understand a screw thread, and in which the aforementioned member has means of locking of this one against an inverse rotation. Preferentially, these means of locking include/understand a deformed portion of the aforesaid threading in the area of its proximate end. One thus improves the behaviour of the implant jusqu has what fusion is carried out.

According to another aspect, the projections of osseous anchoring include/understand a possessing screw thread an outer diameter which decreases in its distal area towards its distal end, to facilitate the penetration of this threading in the vertebral plates.

In addition it is proposed that the aforementioned reinforcing member of anchoring has a wall of proximate end adapted with substantially closing a front opening of the aforesaid body hollow, so that a substance promotrice of osseous growth placed inside the said member is compressed pendent insertion of the aforesaid member in the aforementioned hollow body.

In this case, the reinforcing member of anchoring has at least a portion whose outer surface belongs to a truncated cone. In alternative, the reinforcing member of anchoring is substantially more short than the body and has a generally conical point directed towards the aforementioned wall of distal end of the body:
I1 is beneficial in this case that the wall of proximate end of the member has an opening tapped for temporary fixing of the aforesaid member with an instrument of insertion of the member.

According to another aspect still, the invention proposes an implant such as defined higher, in which the reinforcing member of anchoring has means of indexing to fix the aforementioned member at an instrument of insertion of the member in a given angular relation.

According to another characteristic, the reinforcing member of anchoring has at its proximate end a brought back plug, which can for example be screwed in a tapped front opening of the reinforcing member of anchoring, or engaged by resilient click-and-ratchet work in a front opening of the reinforcing member of anchoring.

I1 is beneficial that this plug has an installation adapted to cooperate with an instrument making it possible to involve the member in rotation, and/or of the adjustments of angular indexing of the reinforcing member of anchoring with an instrument of installation of the aforesaid member.

One also proposes according to the invention that the projections of osseous anchoring include/understand a screw thread, and that at least one of the side branches of the body has a reentrant portion forming net adapted to cooperate with the aforementioned threading.

This reentrant portion can be envisaged only on one of the legs and to then constitute the single portion of the body cooperating by screwing with the screw thread.

Moreover, this reentrant portion can present a substantially straight free end edge.

According to another aspect, the invention proposes an implant in which the aforementioned member is directed into oblique, for example to approximately 450, compared to planar of the corresponding body to planar sagittal.

According to another aspect, it is proposed that through openings are envisaged in the aforementioned member between the inner one and the outer one of this one, the aforementioned openings being lengthened in a substantially circumferential direction of the member.

According to a still different aspect, the body has a wall of distal end, and the reinforcing member of anchoring has a distal end portion adapted to be screwed in an opening of the aforesaid the wall of distal end.

The body can also have in this case a wall of proximate end including an opening wider than outer dimension of the aforesaid reinforcing member of anchoring and in which the aforementioned member can be freely committed.

The invention in addition proposes an implant in which the body present a proximate wall, a distal wall and two lateral walls, the aforementioned walls defining between them an inner space larger than the aforementioned reinforcing member of anchoring. One thus increases assigned space with the osseous growth between the known and underlying vertebral plates.

In this case, the reinforcing member of anchoring can have a portion threaded for its screwing in the proximate wall of the body, or so the aforementioned reinforcing member of anchoring and the distal wall of the body can mutually have means threaded cooperating for fixing of

the aforesaid member with the body.

In such a configuration, the projections of osseous anchoring can include/understand a screw thread having the same step as the aforementioned threaded portion or the threaded means of fixing to the body.

The shape of the body, in this case, is preferably such as the lateral walls and the proximate wall of the body extend substantially on a same circular arc, and that the aforementioned distal wall is substantially straight.

I1 is also beneficial that the faces upper and low of the body have projections of osseous anchoring extending along its walls.

I1 is also envisaged according to the invention a provided implant of means for the rotating mounting of the reinforcing member of anchoring in the inner space of the body while preventing a translation movement relative between those.

These means of mounting advantageously include/understand a formed cylindrical aperture in a wall of distal end of the aforesaid body and a shaft envisaged on the aforementioned member and adapted to be engaged by resilient deformation in the aforementioned opening.

In this particular case, the aforementioned reinforcing member of anchoring present preferentially the shape of a screw possessing two flat diametrically opposite, the aforementioned projections of osseous anchoring being defined between the aforementioned flat and of the sharp edges being envisaged with the transitions between threading from the screw and the flat ones for thus supporting osseous fusion after installation of the implant.

To facilitate the insertion of the implant, the distance between the flat opposite ones is not upper at the distance between the faces upper and low of the aforesaid body.

According to another aspect of the invention, one proposes an implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a whole of generally parallel walls defining at least two inner spaces located side-by-side and exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover at least two reinforcing members of possessing anchoring on their outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned members being adapted to be rotated in respective inner spaces of the aforesaid body.

Advantageously, the aforementioned members are identical.

The invention provides in addition that the hollow body can have different geometries, and in particular
- surfaces upper and low which are inclined one compared to the other one, with a distance between them which decreases by the proximate end towards the distal end of the body; and/or
- surfaces upper and low which are inclined one compared to the other one, with a distance between them which decreases on a first lateral side of the body towards the opposite lateral side.

The invention in addition proposes a set of implants to form a rachidian implant intended to be inserted in an intervertebral space of the human vertebral column while being adapt with the geometry of the aforesaid intervertebral space. This set of implants includes/understands a plurality of hollow body possessing each one a pair of wall lateral delimiting an inner space and adapted each one to be inserted in an intervertebral space in such a way that the aforementioned inner space is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, each one of the aforesaid body having a specific size and a form,
at least a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the bodies, the aforementioned member being adapted to be rotated in the inner space of any of the aforesaid body,
so that a specific hollow body suitable with the particular configuration of a given intervertebral space can be selected among the aforementioned plurality of hollow body.

The sizes and the specific shapes of the bodies can result in particular
- different angles of inclination between their upper and low surfaces.

- different widths; in this case, the hollow bodies widest advantageously present lateral walls in which through openings are formed extending between the upper and low faces of the aforesaid body
- different heights.

- different lengths.

Preferentially, a determined group of hollow body of the aforesaid the plurality is adapted to receive a same type of reinforcing member of anchoring.

The invention proposes finally a process to position in an intervertebral space of an human vertebral column an implant including/understanding a possessing substantially hollow body a pair of wall lateral surrounding an inner space and a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body and adapted to be rotated in the inner space of the body, the aforementioned process including/understanding the following steps
to select starting from a set of possessing hollow body different forms and dimensions an hollow body adapt with the configuration of the aforesaid intervertebral space
to fill the aforementioned hollow body selected with a substance promotrice of osseous growth
to push the aforementioned hollow body in the aforementioned intervertebral space in such a way that the inner space of this one is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space; and
to insert the aforementioned reinforcing member of anchoring in the aforementioned hollow body in such a way that the aforementioned projections of osseous anchoring are anchored in the aforementioned vertebrae suset underlying.

If one wishes to position an implant which the body present of the provided lateral walls of through openings extending between the faces upper and low of the aforesaid body, the process can include/understand moreover, front the step of pushed of the aforesaid hollow body in the aforementioned spaced intervertebral, a step of filling of the aforesaid through openings with a substance promotrice of osseous growth.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects, purposes and benefits of the present invention will appear better with the reading of the detailed description following of prefered embodiments of this one, given as example and made in reference to the annexed drawings, on which
figure 1 is a sight in prospect for an implant according to a first form for realization for the invention,
figure 2 is a sight of profile of the implant of figure 1 placed between two vertebral plates,
figure 3 is a front view of the implant of figure 1,
figure 4 is a sight of top of the implant of figures 1 and 3,
figure 5 has is a side view of an element of the implant of figure 1,
figure 6 is a sight boils about it according to arrow VI of figure 5,
figure 7 is a sight boils about it according to arrow VII of figure 5,
figure 8 is a sight in prospect for the element for figures 5 to 7,
figure 9 is a sight in prospect for an implant according to one second form for realization for the invention,
figure 10 is a front view of the implant of figure 9,
figure 11 is a sight of top of the implant of figures 9 and 10,
figure 12 is a sight of top of a first element of the implant of figures 9 to 11,
figure 13 is a side view of a second element of the implant of figures 9 to 11,
figure 14 is a sight boils about it according to arrow XIV of figure 13,
figure 15 is a sight boils about it according to arrow XV of figure 13,
figure 16 is a sight in prospect burst for an implant according to a third form for realization for the invention,
figure 17 is a side view of the implant of figure 16, assembled,
figure 18 is a sight according to arrow XIIX of figure 17,
figure 19 is a sight according to arrow XIX of figure 17,
figure 20 is a sight in prospect burst for an implant according to a fourth form for realization for the invention,
figure 21 is a side view of the implant of figure 20, assembled,
figure 22 is a sight according to arrow XXII of figure 21,
figure 23 is a sight according to arrow XI IT of figure 21,
figure 24 is a sight in prospect burst for an implant according to a fifth form for realization for the invention,
figure 25 is a side view of the implant of figure 24, assembled,
figure 26 is a sight according to arrow XXVI of figure 25,
figure 27 is a sight according to arrow XXVI I of figure 25,
figure 28 is a sight in prospect burst for an implant according to an alternative for the third form for realization for the invention,
figure 29 is a sight in prospect for the implant for figure 28 with the assembled state,
figure 30 is a sight of rear of the implant of figure 29,
figure 31 is a side view of the implant of figure 29,
figure 32 is a sight of top of the implant of figure 29,
figure 33 is a sight in prospect, front assembly, of an alternative of execution of the third embodiment of the invention,
figures 34 to 36 are three sights in prospect for the body for this alternative for execution,
figure 37 is a sight in end, distal side, of this same body,
figure 38 is a sight in prospect for the reinforcing member for anchoring for this alternative for execution,
figure 39 is a sight of rise on side of this same reinforcing member in anchoring,
figures 40 and 41 are two sights in prospect for the implant according to this same alternative, with the assembled state,
figure 42 is a sight of top of this same assembled implant,
figure 43 is a sight of rise on side of this same assembled implant, and
figure 44 is a sight in end, proximate side, of this same assembled implant.

DETAILED DESCRIPTION FORMED REALIZATION
It will be noted preliminarily that, of a figure to other, elements or portions identical or similar are indicated as far as possible by the same signs of reference.

It will be noted also that the terms proximate and distal used throughout present description correspond respectively at the end of the implant on the side nearest of the surgeon during operations of installation, and at the end of the implant furthest away from the surgeon.

In reference first of all on figures 1 to 8, one represented an implant of intersomatic the cage type which consists of two portions, namely a body 10 and one reinforcing member of anchoring 20.

Body 10 present the general shape of a ring, with an upper face 11, a low face 12, an inner face 13 and one outer face 14.

The contour of bodies 10 present a circular form truncated by a portion of contour straight, its width being for example equal in approximately four third its depth.

Along the portion of contour straight, on the faces upper and low 11 and 12, asperities are spared to ensure a locking of the implant compared to the vertebral plates overlying V1 and underlying V2 (see figure 2) when the implant is compressed between those.

These asperities present in the species the form of three upper ribs lîb and three low ribs 12b, triangular section and concentric circular trajectories following the portion of contour circular of the body.

Contrary to the portion of contour straight, the body there has a thicker wall, materialized by beaches upper and low (not referred).

In this portion of wall is spared a through orifice tapped 18 from which the axis extends into oblique, and preferably to approximately 45, compared to planar vertical perpendicular with the planar distal wall of the implant, planar vertical which corresponds to planar sagittal.

Moreover, the axis of this orifice 18, which extends substantially horizontally, passes substantially by the center of the portion of contour circular, while moving towards the opposite area located at the transition between the portion of contour circular and the portion of contour straight.

The implant according to the invention includes/understands moreover a member 20 intended to consolidate the anchoring carried out with the level of the vertebral plates.

This member present in this example the form of a cylindrical heart hollow 21 on the outer surface whose an helical net 22 is spared which is complementary to formed tapping to the level of orifice 18.

Between the adjacent sections of net are spared a plurality of oblong openings 23 in the direction of the propeller of the net, with the fine ones explained further.

At its distal end, member 20 is closed by a full wall 25. In the vicinity of its opposite face defining its proximate end, it comprises a full portion 24 in which a print in hollow 24a is formed, for example of hexagonal section, for the introduction of a screwing tool (not represented).

I1 is substantial to note, like the watch in particular figure 3, that the overall diameter D in which S inscribed the net 22 of member 20 is slightly upper with the overall height H in which S inscribed body 10, this with the fine ones explained further.

It will be observed here that the length of member 20 is such as it can be screwed in orifice 18 of body 10 until what the outer face of its proximate full portion 24 comes substantially in the prolongation from the outer face 14 from bodies 10 neighbouring the aforementioned orifice.

One now will explain the use of an implant as described above. It will be observed that the same type of procedure, with the adaptations required, will be practised for the other embodiments, further described, of the implants according to the invention.

A distraction being previously operated between two vertebrae to treat, by so known means in themselves, the intervertebral disc is removed at least partially and body 10 of the implant, deprived of its member 20, is set up, by former or posterior way. Advantageously, the inner space of the body is previously filled of osseous grafts, in order to in the long term ensure an intervertebral fusion by osteogenesis.

It will be observed here that the contour of body 10, with the cut side partly proximate, is such as it inscribed so in the surface of a vertebral plate. If required, one can propose to the surgeon different sizes of body 10, to choose according to the rachidian morphology of the patient one, as one will further see it in detail.

The two vertebrae are then released, and a first locking of the body between the vertebral plates V1 and V2 is ensured using the ribs IIb, 12b.

Member 20 is then screwed using a tool in orifice 18. During this movement, the summit portion of the net 22, which overflows slightly upwards and to the bottom compared to the summit portions of the ribs IIb, 12b, notch the faces in with respect to the vertebral plates overlying and underlying with the manner of a self-tapping screw, and thus carries out an additional anchoring which firmly comes to block the implant compared to these plates.

Moreover, the rotation of member 20 as it penetrates in the inner space, filled of osseous grafts, body 10, makes that a portion of these grafts will migrate through the openings 23 until in the inner space of hollow organ 20. The osseous growth thus also will occur through member 20, which advantageously will block member 20 with respect to any particularly inverse rotation being likely to affect the behaviour of the implant in the long term. In alternative, one can provide also that member 20 is previously filled with osseous grafts.

Figures 9 to 15 illustrate one second embodiment of the present invention.

On these figures, elements or portions identical or similar with those of figures 1 to 8 are indicated by the same signs of reference, and one will describe only the differences in this second embodiment compared to the first.

It will be noted first of all that the body 10, which present same contour as in the case of figures 1 to 8, present here a wall of substantially constant thickness on all its periphery.

This body comprises, instead of the orifice tapped 18 of the first embodiment, a smooth through orifice 19.

In addition a cylindrical stem 16 provided of a threading 16a extends in the axis from orifice 19 starting from the area opposite from body 10, located substantially at the transition between its portions of circular contour and right contour.

Moreover, the member 20, which present substantially same outer contour as in the case of the first embodiment, full, is put at hand a central boring 28 emerging with the level of its posterior face and in which is formed a tapping 28a complementary to formed threading 16a on the protruding stem 16 of the body.

It will be observed here that the lead of the net 16a and associated tapping 28a is selected substantially or exactly equal with the lead of the net 22, which remains present on the outer surface of member 20.

Around the outlet of boring 28 is envisaged a frustoconical portion 27.

It will be observed finally that member 20 has on its former face an adjustment of screwing which is in this case consisted a protruding head 26 of hexagonal section for example.

The implant according to this second embodiment is used substantially same manner that that previously explained.

The essential difference resides in what member 20 is screwed on stem 16 with the manner of a nut, size of orifice 19 being selected so as not to make obstacle with this screwing. I1 is enough in this respect choosing a diameter of slightly upper orifice 19 with the overall diameter of the net 22. It will be noted that the frustoconical portion 27 of member 20 makes it possible to previously facilitate the introduction of the posterior end of the aforesaid member into orifice 19 screwing.

The step of the net 16a being the same one as that of the net 22, the progression of member 20 in body 10 as the member is rotated is such as the net 22 comes here still to bite in the vertebral plates with the manner of a self-tapping screw.

In particular, one can provide that the annular faces upper and low 11 and 12 of body 10 extend in the planar ones having a slight skew one compared to the other one, so as to adapt to the form of intervertebral space concerned. Thus one can propose to the surgeon, as one will further see it, of body 10 presenting of the different skews to adapt to the morphology of the vertebrae to treat.

In this case, the embodiment of figures 9 to 15 is beneficial in what one can give to the outer contour of member 20 a slightly frustoconical form, so that the degree of overflow of the net 22 compared to the tops of the ribs îîa and llb remains substantially constant before worms the back of the implant and that, faces concerned of the substantially parallel vertebrae being to the faces upper and low of body 10, anchoring by the net is substantially of the same importance of the proximate end until the distal end.

In reference now on figures 16 to 19, one represented an implant according to a third embodiment of the invention, which includes/understands a body 10 presenting in horizontal section the general form of one U, with a bottom 101 or distal wall and two walls or side branches substantially parallel 102, 103. This body comprises faces upper and low in form of U, respectively 104, 104 ', on which teeth of osseous anchoring are spared, respectively 105, 105 ', in the species of the teeth on sharp board of triangular profile, which fulfill a role similar to that of the ribs lîb of the previous embodiments. One observes in particular on figure 17 that the faces upper and low 104, 104 ' are slightly approaching one other in direction the basic area 101.

In the distal wall 101 is formed a boring tapped 1010 allowing the temporary fixing of an instrument, not represented and conventional in oneself, for the installation of the body in intervertebral space.

Legs 102, 103 define a generally cylindrical inner space, with the fine ones explained further.

Two side branches 102, 103 of the body comprise each one a through longitudinal slit, respectively 106, 107, these slits being intended to authorize an osseous growth laterally.

At the open end of body 10, contrary to its bottom 101, is formed a generally circular opening delimited by a reentrant net 108 envisaged at the proximate free ends of two legs 102, 103.

The implant comprises a reinforcing member of provided anchoring 20 of an hollow heart whose outer surface is slightly frustoconical, while narrowing of its proximate end towards its distal end. On the outer surface of heart 21 a continuous threading 22 is formed.

This threading 22, in the shape of helical formed flat band, is adapted to cooperate with the reentrant net 108 of body 10 to allow the screwing of member 20 inside the said body.

As one observes it in particular on figure 16, heart 21 is consisted three angularly shifted longitudinal legs, separated by empty spaces longitudinal 23.

Each one of these legs comprises a leading edge (i.e. the edge front in the direction of the screwing of member 20) which is sharp in 21a, so as to constitute a member of scraping of the osseous of the vertebrae known and underlying material. This way, the screwing of member 20 will make it possible to fill inner space of the implant with osseous chips, which will support the taken one of Clerc's Office and finally the welding by osseous growth between the two vertebrae.

One will observe here that the outer diameter of threading 22 is preferably very adjacent inner diameter of body 10, so as to ensure, during the screwing of member 20, his guidance inside the body.

Finally member 20 comprises, in its proximate portion 24 formant a casing, an opening delimited by a plurality of bosses 24b separated by zones in hollow 24c. The bosses 24b, which constitute the starter of legs 21 of the heart, carry on their inner surface a tapping.

The implant comprises finally a generally cylindrical plug 30 possessing on its outer surface a threading 31 adapted to cooperate with defined tapping by the bosses 24b. The posterior face 32 of this plug is provided with a print in hollow 32a for a screwing tool.

The implant as described above is used like in the following way
- body 10, deprived of member 20, is set up between the vertebrae to treat;
- member 20, deprived of its plug 30, is filled with osseous grafts by its posterior opening, then the plug is installed in this opening to prevent that the grafts do not escape;
- member 20 provided with its plug is then screwed in body 10 already in place, using a screwing tool engaged in the print 32a; during this operation, threading 22 of member 20 comes to be anchored in surfaces in with respect to the vertebrae known and underlying, with if necessary detachment of osseous chips; moreover, the sharp edges 21a of three legs 21 of the heart of member 20 attack the vertebrae to detach from the chips which will supplement the filling of the inner space of member 20; finally the frustoconical form of heart 21 of member 20 ensures, with measurement of its advancing, a compression of a portion of this osseous material against the walls of the vertebrae, to support the Clerc's Office.

Figures 20 to 23 illustrate a fourth embodiment of the invention, in which body 10 is similar with that of figures 16 to 19, and will not be again described in its unit. It will be observed however that, in this example, single leg 102 of the body is provided of a through slit 106, while the other leg is deprived by it. This type of body is used advantageously when one uses two implants according to the invention in a same intervertebral space. In this case, the implants are laid out side-by-side so that the respective slits of the two bodies are inner side, this in order to support fusion with osseous grafts placed in the area of intervertebral space located between the two implants.

The reinforcing member of anchoring 20 present in this case the shape of a threaded plug substantially more short than body 10 in axial direction. This member has a cylindrical heart full 21 provided of a threading 22 adapted to cooperate with net 108 of body 10, of the same manner that previously.

The posterior face of member 20 has a print in hollow 24a for screwing tool, while its face former 25 present the shape of a cone to round top.

The implant according to this embodiment is intended to be used by filling body 10 of osseous grafts with relatively dense way. This way, the penetration of member 20 during screwing ensures, in addition to the reinforcement of anchoring carried out using threading 22, a compression of the osseous grafts located in body 10, to request them in particular in direction of the known and underlying vertebral plates and to improve fusion.

Figures 24 to 27 illustrate a fifth embodiment of 1 invention. Body 10 of the implant is distinguished from that from the third and fourth embodiments substantially by the fact that the basic portion 101 has a through cylindrical aperture 101a laid out according to the axis of the body, and that the inlet opening located contrary to bottom 101 is deprived of net 108 of the previous achievements.

The reinforcing member of anchoring 20 present here the shape of a screw with wide net, which has at its former end a prolongation in the shape of formed shaft of two axial substantially semi-cylindrical legs 29a, 29b having at their free end an extra thickness, respectively 291a, 291b.

These two legs have a slightly low outer diameter at the diameter of the opening 101a of body 10, and a reduced thickness so that their resilient deformability allows, previously with the installation by the surgeon, the click-and-ratchet work of member 20 in body 10, the aforementioned member 20 being thus blocked against any free translation but in rotation and being guided on the one hand by the opening 101a, and on the other hand by the inner faces of two legs 102, 103 of body 10.

Another essential feature of this embodiment resides in what member 20 is delimited by two cut or flat sides, respectively 201, 201 ', which confer on the member, in its angular position such as illustrated on figure 24, one thickness substantially equal with the thickness of body 10, and this all along this one.

It is observed also that with the transition between threading 22 (from square section) and the cut sides 201, 201 ', the nets form each one a sharp angle 22a.

In addition, as in some of the previous embodiments, the proximate portion 24 of member 20 is provided with a print in hollow 24a for a screwing tool.

The installation of the implant by the surgeon is carried out as follows
- the complete implant, i.e. body 10 sheltering member 20 previously retained and to which one has given the angular orientation of figure 24, is engaged by impaction in intervertebral space, this operation being facilitated by the fact that member 20 does not overflow compared to the limits of body 10;
- member 20 is then turned on him same using an appropriate tool engaged in the print 24a, so that the sharp edges of the nets 22 come to attack the osseous material of the vertebral plates suset underlying, while tearing off from this fact of the osseous chips which will fill free spaces existing between body 10 and member 20 to contribute to fusion.

Owing to the fact that member 20 is blocked against any translation compared to body 10, and does not have thus vocation to be screwed in this one or the vertebral plates, one advantageously gives to the nets a 22 substantial lead, so that the action of screwing privileges a reciprocal slip of the nets 22 compared to the vertebral plates, without inducing sufficiently substantial axial effort to move the implant according to this direction.

Now in reference on figures 28 to 32, one will describe a first alternative of execution of the third embodiment of the invention described higher in reference on figures 16 to 19. In the description which follows, one will not include the elements already described in reference on figures 16 to 19, but only the essential differences brought by the alternative.

According to this alternative, body 1 is widened and designed to receive two reinforcing members of anchoring, respectively 20a and 20b. For this purpose, body 10 is widened and has two side branches 102 and 103 like plain medial intermediate leg 109 extending between legs 102 and 103.

Legs 102 and 109 define the first housing for the member 20a, while legs 103 and 109 define the second housing for the member 20b, the axes of these two residences being here mutually parallel but being able if necessary to adopt a certain skew. These two residences have the same configuration preferably that the single housing of the third embodiment, and the members 20a and 20b are preferably similar to 1 ' member 20 of this same shape of realization.

In the same way, body 10 is provided teeth of osseous anchoring 105, 105 '.

One will observe here, as particularly figures 30 and 31 show it, that the faces upper and low 104 and 10t' of body 10 have a double skew, one corresponding with a bringing together of these faces in direction of the bottom of the residences, and the other corresponding one with a bringing together of these faces in a direction lateral (of right towards the left one on figure 30, but the inverse bringing together being able to be realized while merely turning over body 10 on itself.

This double skew makes it possible body 10 to be established in swash in while restoring lumbar lordosis in the planar sagittal one.

In addition, the increased width of the implant makes it possible to ensure a more stable support between the two vertebral plates, while the presence of two reinforcing members of anchoring 20a and 20b makes it possible to reinforce the strength with the slip compared to these plates.

Of course, this alternative of realization of the invention can apply to all the other implants described in this memory, single an adaptation of body 10, with the range of the specialist of the profession, being required.

In reference now on figures 33 to 44, one will describe another alternative of realization of the implant describes in reference on figures 16 to 19.

According to this alternative, the outer body 10 of the implant understands, of the same manner that previously, a general form of U with two side branches 102 and 103 joined together by a wall of distal end 101, with round transitions.

To increase the width of the implant, and thus to improve his stability, it is provided that side branches 102 and 103 present in lateral direction one thickness substantially upper at that of the legs 102 and 103 described in reference on figures 16 to 19.

Preferably, this thickness is selected so as to give to the overall width of the implant an equal value for example with approximately 1,5 to 2,5 times the diameter of the reinforcing member of anchoring 20.

Moreover, to still improve osseous fusion between the known and underlying vertebral plates, one envisages oblong through openings 110 and 111 extending for example vertically between the upper face 104 and the low face 104 ' from the body, so that side branches 102 and 103 have each one a double wall. In each one as of the these walls is in addition spared a generally horizontal oblong opening, respectively 106, 106 ' and 107, 107 ' which make it possible the inner space of body 10 to open laterally on outer body, into through the two double walls and through openings 110, 111 respectively.

One observes in addition, as show it figures 43 and 44, that the faces upper and low 104 and 104 ' of the body present one compared to other double skew, on the one hand in lateral direction, and on the other hand of the proximate end towards the distal end.

The reinforcing member of anchoring 20 present a construction similar with that which was described in reference on figures 16 to 19. I1 includes/understands an inner fork essentially possessing two legs 21, of which is integral an helical strip 22 formant a net of osseous anchoring, the portions 21 and 22 being preferably realized of only one taking.

The net 22 is preferably here a net self tapper, making it possible to carry out a screwing by attacking the known and underlying vertebral plates directly, without having to previously carry out with the installation a tapping in these vertebral plates. For this purpose, the net 22 present in its area of distal end a radial section 22b in the shape of turned point towards the outer one, and this section varies progressively, for example on the extent of a fraction of turn, until a rectangular radial section 22c. Moreover, the diameter of the net 22 progressively increases its distal end until the aforementioned portion of rectangular section which is here of constant diameter.

One observes also that the outer faces of legs 21 present a frustoconical form, whose diameter decreases by the proximate end towards the distal end, at the fine ones further explained.

The two legs are joined together with the level of a casing 24 which present the shape of a cylindrical ring produced preferably of only one taking with the aforementioned legs.

In this casing 24 can be mounted by resilient click-and-ratchet work starting from outer plug 30 which has a series of flexible legs of locking 33, in the species two pairs of tab, engaging in the central opening of the casing 24 and whose ends in the shape of teeth 33a can come to cling on the inner edge of the casing 24.

Member 20 and its plug 30 are solidarized together with respect to rotation by the fact that each pair of tab 33 comes to closely surround the starter of a respective leg 21 from the fork.

Plug 30 has also a boring tapped 34 laid out centrally and making it possible to receive the end in the shape of threaded rod of an instrument, known in oneself and not represented, of installation of member 20.

One in addition observes on figures 40 and 44 that two notches diametrically opposite 35, spared on both sides boring tapped 34, make it possible to carry out an angular indexing of the aforementioned instrument, then equipped with complementary installations, compared to plug 30 and thus with the whole of member 20 of reinforcement of anchoring.

One then observes, in particular on figure 44, that net 108 allowing to ensure a co-operation screwed between the outer body 10 and member 20 is envisaged only on one of side branches 102 of the body, in the shape of a reentrant chord ending in a generally straight edge 108a.

Finally one observes, in particular on figures 33, 38 and 40, that the end of the net 22 proximate side is deformed, like designated in 22d, this deformation being carried out in direction of the turn of adjacent net, i.e. towards the distal end.

This deformation makes it possible to confer on the net a 22 function of locking against inverse rotation, and thus to prevent that the reinforcing member of anchoring 20, after the installation but front osseous fusion, is not likely to disunite body 10.

The installation of the implant describes above in reference on figures 33 to 44 is carried out with the following successive steps
- first of all, one fills openings 110 and 111 of body 10 of material promotrice of osseous growth, such as osseous grafts
- after distraction so required, one inserts then the body in the species intervertebral;
- one fills member 20 with reinforcement of anchoring avee a material promotrice of osseous growth, then one closes this member 20 at his proximate end by click-and-ratchet work of plug 30;
- by screwing, one engages the aforementioned member in the previously laid body; it is to be noted here that the frustoconical form of two legs 21 of the fork of member 20 allows, measurement of the advancing of member 20, to compress the material of osseous growth and thus to ensure a good contact on the one hand with the known and underlying vertebral plates, and on the other hand with the material of osseous growth previously placed in openings 110 and 111, via openings 108 and 109.

The implants according to the invention are obviously made out of a biocompatible material of appropriate rigidity, such as an alloy of titanium or a stainless steel.

In a beneficial way, one proposes to the surgeon implants according to the invention in the form of a set of implants of forms and of different size, which make it possible to choose the implant, and in particular body 10, the best adapt one with the morphology of the site of installation.

In particular, one can envisage implants
- whose bodies 10 have different heights, with in this case of the reinforcing members of anchoring 20 whose diameters can evolve/move to adapt to these different heights,
- whose bodies have different widths; thus one can envisage, in the particular case of the third embodiment, a range of implants whose widths vary progressively between a minimum width (case of figures 16 to 19) and a maximum width (for example as represented on figures 33 to 44), while varying the thickness in lateral direction of side branches 102 and 103 of the body, while preserving the same size of inner space and thus while being able to use same member 20 in all the cases advantageously, these side branches 102, 103 pass from a single wall (figures 16 to 19) to a double wall (figures 33 to 44) as soon as the thickness of the aforesaid legs 102, 103 became sufficient to make it possible to practise the vertical through openings 110 and 111 I
- whose bodies present upper and low faces of different mutual slopes, as well of before worms back as laterally, with members 20 of identical or different diameters
- of which body 10 and/or the reinforcing members of anchoring 20 present different lengths
- whose reinforcing members of anchoring present different projections of anchoring, and in particular more or less deep and more or less spaced, according to the mechanical characteristics met with the level of the vertebral plates; etc

Of course, the present invention is by no means limited to the embodiments described above and illustrated on the drawings, but the specialist of the profession will be able to bring any alternative or according modifying there to his spirit, and in particular to combine between them the features of the various described embodiments.

In addition, the projections of osseous anchoring as described higher can be consisted by any mean making it possible to ensure a mechanical anchoring and/or osseous connection with the known and underlying vertebral plates. In particular, it can be a question of porous coating or hydroxyapatite.

Result Page

CLAIMS

1. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned possessing hollow body of provided surfaces upper and low teeth on sharp board adapted to be anchored in the aforementioned vertebrae in order toto oppose to the inverse movement of the aforesaid body out of the aforesaid intervertebral space.

2. Implant according to the claim 1, in which the aforementioned teeth present a triangular transverse section.

3. an implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned lateral walls of the hollow body is partially cylindrical and coaxial with an axis of the aforesaid reinforcing member of anchoring.

4. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned lateral walls has through openings authorizing an osseous growth through them.

5. Implant according to the claim 4, in which the aforementioned openings include/understand lengthened slits extending substantially parallel to the direction from insertion of the aforesaid member in the aforementioned hollow body.

6. Implant according to the claim 4, in which the lateral walls of the body are thick walls in which second through openings are formed extending between the faces upper and low body.

7. Implant according to the claim 6, in which the aforementioned first through openings put in communication the aforementioned inner space with the aforementioned second through openings.

8. Implant according to the claim 6, in which it is envisaged through openings putting in communication the aforementioned second through openings with the outer sides of the body.

9. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned hollow body has a wall of distal end connecting the aforementioned lateral walls, the aforementioned wall of distal end being round to facilitate itinsertion of the aforesaid hollow body in the aforementioned intervertebral space.

10. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned hollow body has a wall of distal end connecting the aforementioned lateral walls, the aforementioned wall of distal end possessing a tapped hole for temporary fixing of the aforesaid hollow body with an instrument of insertion of the body.

11. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a screw thread autotaraudor.

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12. Implant according to the claim 11, in which the aforementioned present screw thread a generally quadrangular radial section.

13. Implant according to the claim 12, in which the aforementioned present screw thread a radial section which progressively passes from a substantially triangular radial section to the aforementioned generally quadrangular radial section starting from the distal end of the aforesaid threading.

14. Implant according to the claim 11, in which the diameter of the screw thread increases progressively starting from its distal end until a portion of substantially constant diameter.

15. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a screw thread in the shape of a helical strip encircling an inner space of the aforesaid member of reinforcement of anchoring.

16. Implant according to the claim 15, in which the aforementioned helical strip is connected to a fork extending inside the aforementioned strip in an axial direction of the aforesaid member.

17. Implant according to the claim 16, in which the aforementioned fork includes/understands two legs extending starting from a wall from proximate end of the aforesaid reinforcing member from anchoring.

18. Implant according to the claim 16, in which the aforementioned fork includes/understands legs having an outer surface in the form of portion of truncated cone whose diameter decreases by the proximate end towards the distal end of the member.

19. Implant according to the claim 16, in which the aforementioned fork includes/understands at least two legs possessing each one a sharp edge of driver of the bone.

20. Implant according to the claim 16, in which the helical fork and strip are carried out of only one taking.

21. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, in which the aforementioned projections of osseous anchoring include/understand a screw thread, and in which the aforementioned member has means of locking of this one against one inverse rotation.

22. Implant according to the claim 21, in which the aforementioned projections of osseous anchoring include/understand a screw thread and the aforementioned means of locking include/understand a deformed portion of the aforesaid threading in the area of its proximate end.

23. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a possessing screw thread an outer diameter which decreases in its distal area towards its distal end.

24. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has a wall of proximate end adapted with substantially closing a front opening of the aforesaid body hollow, so thata substance promotrice of osseous growth placed inside the said member is compressed pendent insertion of the aforesaid member in the aforementioned hollow body.

25. Implant according to the claim 24, in which the aforementioned reinforcing member of anchoring has at least a portion whose outer surface belongs to a truncated cone.

26. Implant according to the claim 24, in which the aforementioned reinforcing member of anchoring is substantially more short than the body and has a generally conical point directed towards the aforementioned wall of distal end of the body.

27. Implant according to the claim 24, in which the aforementioned wall of proximate end has an opening tapped for temporary fixing of the aforesaid member with an instrument of insertion of the member.

28. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has means of indexing to fix the aforementioned member at an instrument of insertion of the member in one given angular relation.

29. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying

which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring hollow on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned reinforcing member of anchoring has at its proximate end a brought back plug.

30. Implant according to the claim 29, in which the aforementioned plug is screwed in a tapped front opening of the reinforcing member of anchoring.

31. Implant according to the claim 29, in which the aforementioned plug is engaged by resilient click-and-ratchet work in a front opening of the reinforcing member of anchoring.

32. Implant according to the claim 29, in which the aforementioned plug has an installation adapted to cooperate with an instrument making it possible to involve the member in rotation.

33. Implant according to the claim 29, in which the aforementioned plug has angular adjustment of indexing of the reinforcing member of anchoring with an instrument of installation of the aforesaid member.

34. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned projections of osseous anchoring includes/understands a screw thread, and at least one of the side branches of the body has a reentrant portion forming net adapted to cooperate with the aforementioned threading.

35. Implant according to the claim 34, in which the aforementioned reentrant portion is envisaged only on one of the legs and constitutes the single portion of the body cooperating by screwing with the screw thread.

36. Implant according to the claim 35, in which the aforementioned present reentrant portion a substantially straight free end edge.

37. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned member is directed into oblique compared to planar corresponding body with planar sagittal.

38. Implant according to the claim 21, in which the reinforcing member of anchoring is directed to approximately 450 compared to planar corresponding body with planar sagittal.

39. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring hollow on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which through openings is envisaged in the aforementioned member between the inner one and the outer one of this one, the aforementioned openings being lengthened in one substantially circumferential direction of the member.

40. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned body has a wall of distal end, and the aforementioned reinforcing member of anchoring has a distal end portion adapted with to be screwed in an opening of the aforesaid the wall of distal end.

41. Implant according to the claim 40, in which the aforementioned body has a wall of proximate end also including an opening wider than outer dimension of the aforesaid reinforcing member of anchoring and in which the aforementioned member can be freely committed.

42. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the body present a proximate wall, a distal wall and two lateral walls, the aforementioned walls defining between them an inner space more large that the aforementioned reinforcing member of anchoring.

43. Implant according to the claim 42, in which the aforementioned reinforcing member of anchoring has a portion threaded for its screwing in the proximate wall of the body.

44. Implant according to the claim 42, in which the aforementioned reinforcing member of anchoring and the distal wall of the body mutually has means threaded cooperating for fixing of the aforesaid member with the body.

45. Implant according to one of the claims 43 and 44, in which the aforementioned projections of osseous anchoring include/understand a screw thread having the same step as the aforementioned threaded portion of fixing to the body.

46. Implant according to claim 42, in which the lateral walls and the proximate wall of the body extend substantially on a same circular arc, and the aforementioned distal wall is substantially straight.

47. Implant according to the claim 42, in which the faces upper and low of the body have projections of osseous anchoring extending along its walls.

48. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which means is planned for the rotating mounting of the reinforcing member of anchoring in the inner space of the body while preventing one translation movement relative between those.

49. Implant according to the claim 48, in which the means of mounting include/understand a formed cylindrical aperture in a wall of distal end of the aforesaid body and a shaft envisaged on the aforementioned member and adapted to be engaged by resilient deformation in the aforementioned opening.

50. Implant according to the claim 48, in which the aforementioned reinforcing member of anchoring present the shape of a screw possessing two flat diametrically opposite, the aforementioned projections of osseous anchoring being defined between the aforementioned flat and of the sharp edges being envisaged with the transitions between threading from the screw and the flat ones.

51. Implant according to the claim 50, in which the distance between the flat opposite ones is not upper at the distance between the faces upper and low of the aforesaid body.

52. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a whole of generally parallel walls defining at least two inner spaces located side-by-side and exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover at least two reinforcing members of possessing anchoring on their outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body, the aforementioned members being adapted to be rotated in respective inner spaces of the aforesaid body.

53. Implant according to the claim 52, in which the aforementioned members are identical.

54. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned hollow body has surfaces upper and low which is inclined one compared to the other one, with a distance between them which decreases proximate end towards the distal end of the body.

55. An implant for the surgery of the rachis, including/understanding a substantially hollow body adapted to be inserted in an intervertebral space, the aforementioned possessing body a pair of wall lateral surrounding an inner space exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, the aforementioned implant including/understanding moreover a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of anchoring osseous in an upper diameter with the overall height of the body, the aforementioned member being adapted to be rotated in the inner space of the body, and in which the aforementioned hollow body has surfaces upper and low which is inclined one compared to the other one, with a distance between them which decreases on a first lateral side of the body towards the opposite lateral side.

56. A set of implants to form a rachidian implant intended to be inserted in an intervertebral space of the human vertebral column while being adapt with the geometry of the aforesaid intervertebral space, the aforementioned play including/understanding
a plurality of hollow body possessing each one a pair of wall lateral delimiting an inner space and adapted each one to be inserted in an intervertebral space in such a way that the aforementioned inner space is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space, each one of the aforesaid body having a specific size and a form,
at least a reinforcing member of possessing anchoring on its outer surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the bodies, the aforementioned member being adapted to be rotated in the inner space of any of the aforesaid body,
so that a specific hollow body suitable with the particular configuration of a given intervertebral space can be selected among the aforementioned plurality of hollow body.

57. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of possessing hollow body different angles of inclination between their upper and low surfaces.

58. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body having different widths.

59. Set of implants according to the claim 58, in which the widest bodies hollow present lateral walls in which through openings are formed extending between the upper and low faces of the aforesaid body.

60. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body having different heights.

61. Set of implants according to the claim 56, in which the aforementioned plurality of hollow body includes a group of hollow body presenting different lengths.

62. Set of implants according to the claim 56, in which a determined group of hollow body of the aforesaid the plurality is adapted to receive a same type of reinforcing member of anchoring.

63. A method for positioning in an intervertebral space of an human vertebral column an implant including/understanding a possessing substantially hollow body a pair of wall lateral surrounding an inner space and a reinforcing member of possessing anchoring on its outer

surface of the inscribed projections of osseous anchoring in an upper diameter with the overall height of the body and adapted to be rotated in the inner space of the body, the aforementioned process including/understanding the following steps
to select starting from a set of possessing hollow body different forms and dimensions an hollow body adapt with the configuration of the aforesaid intervertebral space
to fill the aforementioned hollow body selected with a substance promotrice of osseous growth
to push the aforementioned hollow body in the aforementioned intervertebral space in such a way that the inner space of this one is exposed to the vertebrae known and underlying which define the aforementioned intervertebral space; and
to insert the aforementioned reinforcing member of anchoring in the aforementioned hollow body in such a way that the aforementioned projections of osseous anchoring are anchored in the aforementioned vertebrae suset underlying.

64. Process according to claim 63, for the positioning of an implant of which the body present of the provided lateral walls of through openings extending between the faces upper and low of the aforesaid body, including/understanding moreover, front the step of pushed of the aforesaid hollow body in the aforementioned spaced intervertebral, a step of filling of the aforesaid through openings with a substance promotrice of osseous growth.